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BRIEFLY TOLD.

NET COST OF WORKING WITH POWER FROM SMALL MOTORS.—On pp. 772, 773, 774 and 775 will be found the first installment of a very complete translation, from the *Journal des Usines a Gaz*, of a report on this subject made by M. Korte to the Association of German Engineers. As is usual with authors of his type, and in consonance with the practice of Continental engineers as a rule, M. Korte goes to the very bottom of the details, and as a result the figures are evidence of the carefulness of the examination and of the comparisons that were made. We do not now recall to mind that any other published treatise contains such complete summarized statements of the cost to the user of the four named classes of motors treated of, and have no hesitation in saying that M. Korte's tables will command wide-spread notice in this country. To the gas engineer they are particularly interesting and full of promise, for they show quite plainly that with well-directed effort on his part the field for small motors should be practically at the mercy of the product that he manufactures. One striking feature of the tables that nominally is against the gas motor is the greater first cost of apparatus and installation. From his compilation we find the following—taking the 1-horse motor in each class as our specimen :

	Gas Motor.	Hydraulic Motor.	Electric Motor.	Compressed Air Motor.
Total cost of establishing plant	$408.68	$226.29	$139.44	$237.14
Cost to operate, 3,000 hours..	147.98	467.11	561.62	460.71

But while this excess will act towards causing in the mind of an intending power user an unfavorable first impression, a glance at the totals respecting the annual cost of running each motor 3,000 hours per annum ought to convince the investigator that the gas motor at an expense of $408.68 for first installation was the cheaper instrument at the end of the first year for him by $144.40 than had he installed an electric motor at a first cost of but $139.44, the saving meanwhile having accrued from the difference in cost of operating the machines. In his second year of use, however, the economy will amount to a clear gain of $413.64, and that will be kept up in following years. The reduction of the figures from foreign to American equivalents involved a great amount of labor, and we doubt not that the enterprise which prompted the work will be appreciated by our readers. The second and concluding installment will be given in our issue for next week.

SADTLER'S HAND-BOOK OF ORGANIC CHEMISTRY.—We are indebted to the publishers (the J. B. Lippincott Company, of Philadelphia) for a copy of Dr. Sadtler's "Hand-Book of Industrial Organic Chemistry," which is arranged by the author for the use of "manufacturers, chemists and all interested in the utilization of organic materials in the industrial arts." The book, which is printed in the well-known style that characterizes the publishers whose imprint it bears, comprises 14 main chapters and an appendix, which are subdivided into 105 sections, each of which teems with matter of interest to those engaged in any branch of manufacture in which "industrial organic chemistry" is interwoven. The book carries 127 illustrations and 16 diagrams, all of which contribute greatly to a better comprehension of the text. Chapters I., XI., XII. and the appendix are of especial interest to those engaged in the

gas industry, in that they are more or less devoted to a summary of the materials, methods and processes employed in the manufacture of gas and to the development of the residual products from the partly spent materials. The sections devoted to the handling of tar, ammoniacal liquor, etc., are particularly interesting. We must confess, however, that Dr. Sadtler appears to have overlooked one thing, which is his failure to mention anything of moment respecting water gas manufacture and manipulation, an omission all the stranger from his having recounted some of the methods by which natural gas is brought to the point of acting as a direct illuminating agent. The appendix is rich in tables of interest to the gas engineer, although candor compels the admission that the Doctor's compilation in this respect is not more complete or compendious than is that of the Newbigging Hand-Book. The book contains 519 pages, 19 of which are taken up by an excellent index. In conclusion, we may remark that to us it seems well worth its market price ($5) to any one interested in the gas industry.

SPECIAL WESTERN CORRESPONDENCE.

By Sunset.

Dear Journal:—I had occasion lately to spend a week in Chicago, on general, all-around gas business, that brought me in contact with most of the gas men in that city. Since that visit, I have ceased to wonder at the formation of the Gas Club of Chicago. Hitherto I had wondered somewhat with others, and had questioned the feasibility of making a "go" of the Club, from not realizing what a number of gas men there are in the city and vicinity to draw upon.

First and foremost, of course, come those directly connected with the big Chicago Companies. Although now merged into one management, yet the organization of each Company is maintained, and as each one is large enough to require Superintendents of stations, of Distribution and Chief Engineer, besides the usual offices of President, Vice-President, Secretary, Treasurer and Assistants ditto, it can readily be seen what a considerable number of Club members should be eligible from the local Companies alone. There are probably thirty, among whom the names of Messrs. Knapp, Billings and Judson come, perhaps, first to one's lips as the foremost in the able executive management now dominant in Chicago. For certainly that is the predominant feature that strikes one in a now-a days round of the various stations, or in contact with the management proper. But that the large Chicago Companies cover the field of gas men is far from correct. There are enough smaller ones to make a small sized club in itself, should they all turn out simultaneously.

Thanks to the enlargement of the confines of the Windy City, South Chicago—some 12 miles from the City Hall!—is now in it, bringing the two Watriss brothers and C. A. Jackson, as President, Electrician and Superintendent, respectively. Probably on the plea of future enlargement of the city, and hence, "room for all," the Economic Company swells the list, and its Construction Company (The Chicago Contract Construction Company) brings in its President, Geo. Yuille, whose ability to smile and look wise when asked what the Company is doing, is only equalled by his ability to look bland and tell one precious little.

In enumerating the gas companies here, it is hardly fair, too, to omit the Pintsch Compression Company. Never making much ado, but quietly pushing its business, it has prospered until there are now nearly as many compression stations as there are big railroad depots, and until the necessity arose for even larger works than heretofore, which have just been completed this summer.

It is we poor out-of-towners, however, who work for six weeks to get six hours off to buy pipe or something in Chicago, and incidentally call on a busy in-towner and make him show us around, *and* the elephant—who contribute quite as much as any, methinks, to the quota of gas men and available Club members.

Chicago is like Boston in having very many small, prosperous towns near it, the gas men from which come to town like clockwork for reasons certainly too numerous to mention. Sometimes they will scarcely bear it! Distance seems to make no odds—20 miles or 200—they insist on coming. To mention them all is impossible; but such shining lights as Cowdery, of Milwaukee, Littleton, of Quincy, and the representatives from Racine, Eau Clair, Grand Rapids, Michigan City, Elkhart, Keokuk, Davenport, Rock Island, Clinton, Dubuque, Rockford, Galesburg, Galena, Elgin, Springfield and a host of similar cities from all points of the compass, should not be forgotten. Never all in town at once, but one can always find some other kindred spirit if you know where to look for him. Finally, but by no means least, are the supply men in the city. What with Crane Co., Jones & Laughlin, the National Tube Works, the Reading Pipe Works, and a score others, one can find no end of pipe men. Firebrick, led off by the old reliable Chicago Retort and Firebrick Company, numbers a dozen concerns—Geddes can tell you all about them. Persons, Harper, Stratton, Dickey and Stout form a galaxy of stars in the meter business. Griffin, McDonald, Goodwin, the Maryland and the American Companies would doubtless surely assign should they lose them. Van Wie, Roper, Hubbard, Sumner and a host of others maintain their respective ends among gas stoves. Gas engines, burners, brass goods, chandeliers, gas machines, meter registers, and devices and trades innumerable are represented, and each with some pushing manager or agent more than eligible in the Gas Club. Not to be forgotten either are the construction companies, foremost among which is the National Gas Light and Fuel Company, experiencing a decided boom with its new manager from the East, Mr. Shelton. The old members, Mr. Clary and Mr. Morrell, of this Company, I am told are out of it entirely and gone into the water works construction business, though still in Chicago. The Fahnehjelm Fuel Gas people also have headquarters in the city, and its Fuel Gas Company at Hyde Park should be added to the list. The Bouton Foundry is right in the list of gas apparatus constructors, if its boxes at Louisville are any criterion of the work it does, and President Bradley is rarely absent from any bunch of gas men happening to be in town. C. E. Booth, an old G. Shepard Page man, and formerly of your city, is alone in the uniqueness of being on the Board of Trade, but a good man withal!

Dear old Uncle Jerry Howard is now living in Chicago, and one of the best of members—in fact the President—of the Club. But to call him old is cruel. White though his beard may be, one swears he is but 22 in every other way, after five minutes chat with him.

With all these above do you wonder that a Gas Club was formed, or doubt that it should prosper. I did once, but do not now, after having met half the above and heard of the other half and more (whose names now escape me) in my comparatively brief stay. Nothing but apathy or lack of co-operation of the members can prevent the Club being a success. The numeral strength is certainly all sufficient.

Speaking of Chicago and success generally, what think you of a Company that has added this season 10 million feet to its daily producing capacity and is now building a holder of 4½ millions. Such is the history of the passing year of the Chicago Consolidated Company, so to speak. Business is evidently booming.

A good deal of gossip is on tap in the West from the returned men who went to the American meeting, anent the lively time promised over the World's Fair episode. It reminded them of the row in the Western, three meetings ago, which was finally disposed of by the wiser heads "referring to the Council," as usual. What the new committee will do is looked forward to with some curiosity as well as interest. If co-operation of Western men is called for it will not be found wanting.

It is still Winter but Detroit is already brewing. Secy. Littleton is picking out the victims for papers and everyone seems arranging to go, when the time comes. I hear some talk of June instead of May. To many it would be more acceptable. Vice-President Croul, of Detroit, and Superintendent Isaac Baxter, are good fellows among good fellows, and I advise everyone to go there if possible. The entertainment will be royal, I'll warrant.

St. Louis is a great place for testimonials. Geo. H. Brown left Station B the other day to join Mr. Egner in the Standard Company of New York. A watch charm pendant, with a lamp-post rampant, as the chief device, was presented to him by the employees of the station. Both shifts "celebrated," with the result that the holders were accouchant next morning and the station about a third short of the regular make.

The pendant I am told had a diamond radiant as the gas jet and was altogether extremely handsome.

Mr. Thompson, Jr., is advanced to the Superintendency of the station, vice Mr. Brown, of which well-earned promotion all his many friends are glad.

The Market for Gas Securities.

Consolidated gas is at 99¾ to 100, Equitable at 122–126. The event of the week was the scare in Standard common, many thousands of shares of which the present executive claims were issued without a proper return in value therefor to the Company. It is said that ex-President Andrews offers to compromise by returning something like 1½ millions of stock to the Company, but ordinary holders of record need have no uneasiness over their certificates. The Company is responsible for them. It is pretty well-assured that the Company has made its peace with the Board of Health. In Brooklyn the situation is somewhat improved, and in the outside market Chicago gas still holds the attention of speculators. The stock is markedly strong.

[A paper read before the Society of Gas Lighting.]

The Relations of a Gas Company to its Consumers.

By Mr. A. B. Slater.

At the last annual meeting of the American Gas Light Association, held in the city of New York, in October last, Mr. Walton Clark presented and read a paper entitled "Meter Rents—a Question of Equity and Policy."

At the outset he assumes certain propositions as generally admitted, viz.:

"1st. A gas company ordinarily has, and it is to the general interest that it should have, a regulated monopoly of the right to open streets and occupy the subsoil for the purposes of gas supply.

"2d. Its rights have their origin in the citizens of the State.

"3d. These rights involve peculiar obligations to the public granting them.

"4th. In common with railroads and other corporations performing a public service, a gas company is under obligations to make no distinction in its treatment of individuals served by it."

After quoting Judge Baxter, of the Sixth Federal Circuit, in a decision rendered in a suit against the Pennsylvania Railroad Company, for damages resulting from a discrimination in charges on coal carriage based upon difference in quantity, serving to illustrate the principle that corporations "organized to do a public work must so regulate their charges that the net return to them, or the profit they make, shall not vary per unit of service rendered," he continues with an argument which displays acuteness of perception, keenness of observation and ingenuity in analysis of details, to show the wisdom of the policy of a gas company in charging a fixed price to all consumers for gas, and add to the bill an item which he would call "meter rent," which is understood to include or "be made up of those items of cost which are not dependent on the volume of gas a consumer buys, and which must be charged to him as a fixed sum per month," and "would be to each consumer the same only to the extent that it covered the items of bookkeeping, printing, collecting, etc. The items of service pipe, meter maintenance and interest would vary with the size of each and the length of the former."

His conclusion is that the adoption by a gas company of such a plan, which he styles "the equitable plan of selling gas to consumers of large and small quantities at prices that shall result in the same profit per 1,000 cubic feet to the company supplying it, would not prove injurious to the company's interest." It would seem to be doing Mr. Clark no injustice to consider that the latter clause is intended to mean that such a plan, if adopted by a gas company, would prove beneficial to its interests.

I can hardly agree with Mr. Clark in his first proposition, viz., that gas companies in this country have a regulated monopoly of the right to open streets and occupy the subsoil, etc. As far as my knowledge goes, very few companies in this country have any monopoly of such rights in the streets; but I do agree with him that "it is to the general interest that gas companies should have a regulated monopoly of such rights for such purposes."

To his second and third propositions I heartily agree. His fourth proposition, while theoretically and substantially true, I think is open for discussion, in its application in the sense that he would have it applied by a gas company in its policy with regard to its dealings with and its relations to its consumers or patrons.

The subject opens up a wide field for discussion, as it involves the scaling of prices for different quantities of gas purchased, or consumed by each consumer, discounts for prompt payment, variation in price for gas used for different purposes, such as illumination, domestic or mechanical purposes, etc.

I think it was formerly a general rule with gas companies to charge a certain rental per month for the meters, service pipe and connections, where the consumption of gas was less than a certain fixed quantity during six months or a year, the amount charged depending on the size of the meter and the quantity of gas consumed.

The service pipe would be run to the curbstone or line of the street without charge to the consumer, and the remaining portion which was necessary to reach the meter would be laid by the company and the expense thereof charged to the consumer. One gas company would furnish the meter connections and stop-cock and set the meter without charge, while another company would compel the consumer to employ a plumber, who would take the meter, which would be delivered to him at the gas office, set and connect it, the whole expense for which would have to be paid by the consumer.

Whenever complaint was made that the light was bad, a man would be sent to examine the service pipe and meter. If any trouble was found in either it would be remedied, but if the trouble was in the outlet pipe the consumer would be notified that he must employ a gasfitter and pay him for his time in doing whatever might be necessary to remedy the difficulty.

Such were some of the "Rules and Regulations" which consumers of gas were obliged to conform to when using gas.

Years of experience in the manufacture of illuminating gas, together with improved apparatus and machinery and improved processes, to say nothing of competition with kerosene oil and electric light, all have had more or less influence in changing and improving the management and policy of gas companies in their relations to their consumers, and which react favorably to the success and prosperity of the companies.

After an experience covering a period of more than 38 years, I am clearly of the opinion that there should be but one price for all gas consumed by all classes of consumers; but if from local circumstances and conditions, which may, perhaps, have obtained for years, a small rebate may be made at the end of the calendar year to large consumers—say 1,000,000 cubic feet per annum.

There is no real or valid reason why the municipality should pay a less rate per thousand cubic feet than other consumers. Certainly, street lighting is the least satisfactory of any portion of the business, as the quantity of gas consumed is not measured by a meter, but estimated from the nominal size of the burner, and an average length of time they are burning; or, where they are kept burning all night, a stated price per post is charged.

Again, the expense of street lighting is paid for by the taxpayers, and just in proportion that the price is reduced to the city the price to the general consumer must be more; at the same time the directors of a gas company may, from motive of policy, deem it best to make a small concession to to the city for its gas. The grand underlying principle in the management of a gas company in its relations to its consumers is exactly the same that all successful tradesmen apply to their business, which is, do everything that is proper and consistent, and please your customers, if you can.

How long would a grocer hold his customers if he added to his bill of goods delivered a charge for delivery, upon the plea that it cost him more to deliver the goods to the customer than when he delivered them at his own store; yet, in the same sense that Mr. Clark would charge "meter rent," such statement would be true. Although there is scarcely any relation between the scales and measures of a grocer and the meters which must be furnished for every customer of a gas company, yet the argument is often brought up by the consumer that a grocer has just as much right to, and there is just as much sense in the grocer charging his customers for the use of his scales and measures as there is for the gas company to charge the consumers for the rent of the meters.

The discount system has little to commend it and much to condemn it. The only reason for the discount system at all is to offer an inducement to the consumer to pay his bill promptly.

The net price is all the gas company wants for its gas, and a customer who intends to pay his bill will generally pay it within a reasonable time.

If he is of that class that intends to postpone the payment of the bill as long as possible, the sooner he is notified that payment must be made or the gas supply discontinued, the better. If he is of that class that does not intend to pay at all, the sooner the supply is stopped the less the gas company will lose, and it is for the interest of the gas company to let the electric light company have him.

Again, the discount rule is no rule unless it is lived up to strictly. A customer who consumes a large quantity of gas per month and neglects to pay his bill within the discount time, whether from carelessness or oversight, makes no difference; if the rule is ignored in his case another consumer who neglects, for a day or two over the discount time, to pay his bill has just as good a claim and just as good a right to demand it as the other one; and if it is allowed the rule amounts to nothing. If it is not allowed bad feeling is engendered, and the effect of enforcing such a rule is to create enemies to the gas company.

Good judgment dictates that you be frank with your customers, sell gas as low as you can afford to and give the stockholders a reasonable return for their money invested, make the bill at a stated price for all, make no petty charges for meter rent, attendance for bad lights or complaints.

When we make different prices for different quantities of gas consumed—that is, lessening the price as the quantity of gas consumed in a stated time increases—then the cry is that we are favoring the rich as against the poor.

When discounts are made, or different prices charged, the clerical work is increased, and the liability to errors is also increased.

Questions by consumers, relative to bills, are multiplied, explanations demanded, vexations and worriment of both consumers and collectors or clerks are greater; when, with one general price, almost the only question that arises is the size of the bill.

Radical changes should be well considered and adopted with caution. Customs which have prevailed for a long time cannot always be interfered with successfully or advantageously.

The settlement of the question, whether it is better to deliver the bills to the customers and give them an opportunity to pay them at their own premises, or compel the consumers to go to the gas company's office to get their bills and pay them there, should depend largely on what the custom has been with the company.

The tax collector has the power to compel the taxpayers to come to his office and settle, but where a gas company has, for years, followed the custom of employing collectors to deliver the bills and collect them, it would not be good policy to change at once and have all the consumers go to the office to get their bills and pay them there.

It is not good policy to have a set of cast iron "rules and regulations" and enforce them in an arbitrary manner. While there should be system and order in conducting a large business, when it is a corporation doing business with the public, like a gas company, especially as it is what the people are pleased to style a "monopoly," the wisdom and good judgment of the manager can be exercised to better advantage to the company than a set of fixed rules and regulations which must always be rigidly enforced.

The management of gas companies should be improved upon year by year, as we know is done in all other kinds of business. It is shown in improvement in apparatus for manufacture, in selling a better quality of gas at a cheaper rate, and in being more liberal in our dealings with the public. The custom of charging the consumer for a portion of the service pipe, for setting the meter, or for rent of the meter, even in the case of small consumption of gas, all these petty charges should be abolished. The revenue from all these sources is of comparatively small amount at the end of the year, the work is simplified and further inducements are offered the people to take the gas in place of other means for illumination and for domestic and mechanical purposes.

Scientific nicety, mechanical principles and algebraic formulas can be employed advantageously by the constructing engineer, but they can hardly aid the manager of a gas company's business in his endeavors to improve upon the policy of the company in its relations to its consumers.

The manager of a gas company that has a capital which represents money actually and honestly expended, and if good judgment has been exercised in the design and construction of the works, is not hampered from over capitalization, the ratio of capital per thousand feet of gas sold is not excessive, the earning capacity of the business will allow of a reasonably low price for gas sold, and he need have no fears that the abolishment of the petty charges mentioned will disturb a proper relation of capital to output; on the contrary, the probability is that the increase of sales of gas will more than offset any such tendency.

If the directors of a gas company have inaugurated and steadily pursued a policy of making all the money they can out of the public, and have, to a greater or less extent, watered their capital, it must be considered an unwise policy, even from a purely business standpoint. The items of depreciation and wear and tear should always be kept in mind and provided for year by year, and the real value of the plant at any given time is that for which it could be duplicated to do the same work, without any regard to what it has cost, as appears by the books of the company. Whenever the nominal capital is very much more than such actual value of the plant, it is in my judgment a departure from sound business management and true policy for any company whose very existence is derived from the people, whose business is circumscribed in its limits, and where a mutuality of interests should never be lost sight of. Where the capital is less than such actual value of the plant, then the company will be serving its own interest if the price of gas is made correspondingly low, as the net profit per 1,000 feet of gas sold, to pay a reasonable dividend, must be less and also because such difference in value must have come from the consumers who should in turn have the benefit of it in the price they pay for gas.

The question of whether the consumers of gas can be best served by private, or quasi-public corporations, or by municipal ownership of gas works, is attracting considerable attention of late in some portions of the country.

I think it is outside the province of any municipality to engage in any kind of manufacturing business. It is an unwarranted interference with private enterprise, which, as it sustains such relations to the public, and occupying the subsoil of the public highways, should be governed by such wise, proper and reasonable statutory regulations as experience dictates are necessary to protect both the stockholders of the company and the public, including a limitation of capitalization and of profits. In the case of municipal ownership rigid rules and regulations are enforced in what the consumer considers an arbitrary manner. Where private ownership prevails, competition with kerosene oil and electricity conduce to less stringent rules and regulations and consideration in enforcing them. A town or city cannot build gas works, but are obliged to employ the construction companies to do it for them, as a private corporation does. In the matter of management the same course must be taken—that is, a competent engineer or manager must be employed, and if the general control is vested in a committee of the city council, or commissioner of public works, in either case, they have little or no actual knowledge of the business and are likely to be changed every year. How is the consumer of gas going to be benefited by such management?

One writer says that in the city of Philadelphia, where the gas works have been owned and under municipal control for years, while the consumers nominally pay $1.50 per 1,000 for gas, they really pay but $1, as the 50 cents goes into the city treasury, but he fails to explain what reason or justice there is in taxing the gas consumers 50 cents per 1,000 for the gas they consume to help pay other people's taxes who are not consumers of gas. There is always a class of persons unhappy because they have to pay any tax, to say nothing of their own proper share of the revenue derived from taxation.

Again, there is very little reason in compelling a gas company to pay into the city treasury thousands of dollars every year for what is called the "valuable franchise," especially when the gas company keeps in good order and condition the streets it opens as it should do. It is the custom in some cities for the gas company to pay to the city a certain sum of money for each place opened in the streets.

It requires a certain sum of money to be invested in a gas works, gasholders, land for the plant, street mains, service pipes, meters, connections, etc., all of sufficient capacity to supply a town or city with gas. The investment should be made with a practical knowledge of the business and with good business ability and judgment. The promoters of the enterprise are entitled to a fair return for the use of their money, which, when once invested in such an undertaking, cannot be used for any other purpose.

The company being what is styled a quasi-public corporation, should, as I have already said, be governed by wise, reasonable and proper statutory regulations. Gas companies generally are governed by a board of directors who are representative men, and who are identified with the progress, welfare and prosperity of the town or, city, and where they have in many cases lived for years.

It costs something to make and distribute gas over a large and extended territory, notwithstanding the ever-present tyro in chemistry and invention who has discovered a "new process" by which he can make for nothing a better gas than can be made by any other process. The true policy is to pay the stockholders of a company a reasonable return for the use of their money, keep the property good and sell gas at a price that will do that and simply pay the expense of running the business.

A company that does that can always satisfy reasonable men, whether in a city council, or consumers of gas generally, that the business is carried on with due regard to the rights of the people as well as the stockholders of the company, and it will not find its customers very much dissatisfied if no meter rent or other little charges are made with a view of trying to make uniform the profit per unit of service rendered.

An Estimate of the Net Cost of Working with Power Produced on the Premises by Small Motors.

[Translated for the JOURNAL, by Mr. C. S. Davis, from the *Journal des Usines a Gaz.*]

At a conference held by the Association of Mining Engineers, of Barmen and the neighboring towns, M. Korte presented a very interesting paper on the subject of small motors, the general features of which are presented below, as taken from the report made by the *Journal of the Association of German Engineers.*

The expenses of running motors are too often calculated in an incomplete manner. Either purposely or otherwise, those factors are overlooked which would show the result to have been obtained under conditions very different from the true ones. The author in the present case has endeavored to avoid this fault, as may be judged from the following:

Here we have the entire classification adopted for all motors employed in the smaller industries :

1st Motors capable of being fed from a central station—water, gas, electric and compressed air.

2nd Motors not found under the preceding heading—steam, hot air, and petroleum.

I have studied, said M. Korte, all the motors of the first class ; but among those of the second, only the steam engine and the hot air motor. I have omitted the petroleum motor (which is, in my opinion of very great importance*) since the method of setting it up is essentially similar to that of a gas motor, and as the calculation of cost of running this sort of engine is very simple.

Remarks on Table No. I.—Gas Motors.—This table has been compiled by taking as a basis the cost of, and figures for consumption as given by Deutz in his manufacture of gas engines. These figures for consumption have been confirmed by various experiments and tests, those made by Slaby among others. I have supposed that the materials employed in all these machines are, as a general rule, of the best quality.†

These calculations are based on an actual running period of from 10 to 5 hours per day, for 300 working days per year. The use of any shorter working periods would have complicated the task beyond measure.

I have further presupposed in every case that the motors ought to furnish their nominal return. As this hypothesis is never entirely realized in practice, but, on the contrary, in the majority of cases, the entire power of the motor is not employed, the cost of running, calculated in horse-power per hour, ought never to be considered other than as *minima*.

The same is true of the figures in the other tables. The observation made above upon the advantage to be found in the use of the best machines, is confirmed by the figures given for the motors of the first and of the second group, when the upright engine, whose consumption of gas is very considerable, is placed in comparison with the horizontal engine working under more advantageous conditions. It is seen, in short, that the horizontal motor of one horse-power, when it runs at half its power, does not cost appreciably more than the vertical motor of ½ horse power.

Gas motors are received with widely different degrees of approval in different cities. Anyone acquainted with the cost of production in making illuminating gas, will readily understand that consumers may be guaranteed a very considerable reduction in the price of gas employed as a motive force without thereby seriously affecting the profits. In any case, a powerful impetus would be given to the industry by furnishing gas to motors at a low rate.

The gain in total consumption obtained by a reduction of the price of gas when used as a motor power, is well emphasized by the very considerable increase of industry in the city of Barmen. In 1884, when there had been no rebate made in the price of gas (which was then about $1.20 per 1,000 cubic feet), there were 41 motors in use, representing a total nominal horse-power of 117.25 ; and the annual consumption of gas was some 4,315,676 cubic feet.

In 1885, with a 10 per cent. reduction on the price of $1.20 per 1,000 cubic feet, there were in service 70 motors, represnting a total nominal horse-power of 166.33, with an annual consumption of 5,774,247 cubic feet.

On the 1st of July, 1885, the reduction was increased to 25 per cent., and there were in service after that, until 1887, 125 motors, representing a total nominal horse-power of 241.5, with an annual consumption of gas of 8,873,271 cubic feet.

On July 1st, 1887, the reduction was again increased, this time to 33 per cent. There were in active operation, from July, 1887, to July, 1888, on an average, 149 motors, representing a total nominal power of 283.75 horse-power, and an annual consumption of 15,016,576 cubic feet.

In the year 1889—1890, these figures were further increased to 192 motors, corresponding to a total nominal horse-power of 350 and to an annual consumption of 18,419,674 cubic feet of gas.

As the production of gas in Barmen is some 237,403,164 cubic feet, of which 180,508,847 cubic feet are delivered to individuals, the motors consume only 10.2 per cent.

As gas motors are chiefly employed during the day, the production of gas is not under these conditions too heavily taxed by this increase in consumption ; and by estimating the profit per 1,000 cubic feet at $.4782,

* This observation is less true in France than in Germany, because of the increase in France of the customs duty and of other taxes on mineral oils.

† The author has overlooked, in his running expenses, the water used in cooling the cylinder, some 10.567 gals. per horse-hour.

TABLE NO. I.—*Gas Motors.*

	Vertical Motors.		Horizontal Motors.				
	¼ H.P.	½ H.P.	1 H.P.	2 H.P.	3 H.P.	4 H.P.	6 H.P.
1. Cost of motor, including bolts for fastenings	$156 81	$289 50	$361 88	$446 31	$535 58	$639 31	$868 50
2. Sum of net cost of condenser and pipes ($6.03⅓ + 4 per cent. of above cost)	12 30	17 61	20 51	23 88	27 45	31 60	40 77
3. Freight and setting up	7 96	10 62	12 06	13 75	15 44	17 61	22 20
4. Expenses for foundations ($4.82½ + $3.61½ × number of horse power)	5 73	6 63	8 44	12 05	15 66	19 27	26 49
5. Sundry expenses in starting	4 10	4 83	5 79	7 96	10 13	12 30	16 65
Total expense of first establishing	$186 90	$329 19	$408 68	$503 95	$604 30	$720 09	$964 61
Cost of Running for 3,000 *Hours* (10 *Hours per Diem.*)							
6. Interest, sinking fund and repairs (4 pr.ct. + 5 pr.ct. + 2 pr.ct. = say 11 pr.ct. on first establishing)	$20 57	$36 21	$44 95	$55 44	$65 92	$79 21	$106 25
7. Expenses connected with the gas—							
Consumption per hour, in cubic feet	17.65825	24.72155	35.3165	70.6330	100.652	134.2027	190.7091
Cost at rate of $0.683 per 1,000 cubic feet	$36 18	$50 66	$72 38	$144 75	$206 17	$275 03	$390 83
8. Cost of oiling and wiping per hour ($0.00120625 + $0.0024125 per horse power)	5 43	7 24	10 86	18 09	25 33	32 57	47 04
9. Overhauling and cleaning (100 to 150 hours per year, at $0.0965)	9 65	10 13	10 86	11 58	12 06	13 03	14 48
10. Rent of premises, etc.	4 83	5 55	6 03	7 24	8 44	9 65	12 06
11. Light and miscellaneous expenses	2 41	2 41	2 90	3 62	4 34	5 07	6 51
Total expenses for running for one year	$79 07	$112 20	$147 98	$240 72	$322 26	$414 56	$477 17
Entire cost per horse-hour	106	075	048	041	036	034	031
Cost of gas alone per horse-hour	048	034	024	024	024	022	022
Summing up of other expenses per horse-hour	058	041	024	017	012	012	01
Expenses of Running for 1,500 *Hours* (5 *Hours per Diem.*)							
Items 6, 10 and 11 as above, total	$27 81	$44 17	$53 88	$66 30	$78 70	$93 93	$124 82
Cost of gas—half of the amounts of item No. 7	18 09	25 33	36 19	72 38	103 09	137 51	195 41
Cost of oiling and wiping—two-thirds the amounts for item No. 8	3 62	4 83	7 24	12 06	16 89	21 72	31 36
Overhauling and cleaning (from 70 to 110 hours)	6 76	7 24	7 72	8 44	9 17	9 65	10 86
Total running expenses	$56 28	$81 57	$105 03	$159 18	$207 85	$262 81	$362 45
Running expenses per horse-hour	150	109	070	053	046	043	041

the gas used for motive power alone gives a profit of $8,807.80. I am firmly convinced that by a further lowering of the price, a very considerable increase would result to the city.

Remarks on Table No. II.—Hydraulic Motors.—This table has been prepared by taking as a base the cost of and the figures for consumption of the Adam House of Munich. The water pressure is six atmospheres. The running expenses, which, in this case, appear excessive, are due principally to the high cost of the water, as is nearly always the case in

TABLE NO. II.—*Hydraulic Motors.*

	¼ H.P.	½ H.P.	1 H.P.	2 H.P.
1. Cost of motor, including setting	$108 56	$139 93	$193 00	$265 38
2. Expenses of starting	5 79	6 76	8 44	12 06
3. Pipe system of influx and discharge	15 68	17 61	21 23	23 16
4. Accessories	2 41	2 90	3 62	4 83
Total cost of establishing plant	$132 44	$167 20	$226 29	$305 43
Running Expenses for 3,000 *Hours* (10 *Hours per Diem*)				
5. Interest, sinking fund and repairs—say a total of 11 pr.ct. on first cost.	$14 57	$18 39	$24 89	$33 60
6. Tax for water at a pressure of 6 atmospheres (city water)	108 56	217 13	419 78	810 60
Consumption per hour, in gallons	396.263	792.525	1452.963	2958.76
7. Rent of water meter	$2 41	$2 90	$3 14	$3 14
8. Cost for oiling and wiping ($1.21 + .00120625 per horse-hour)	2 17	3 14	4 83	8 44
9. Overhauling and cleaning, at a rate of $0.0965 per hour, 50 to 75 hours.	4 83	5 31	6 03	7 24
10. Rent and miscellaneous expenses	4 83	6 03	8 44	12 06
Total annual expenses	$137 37	$252 90	$467 11	$875 08
Cost of running per horse-hour	1834	1689	1568	1448
Total of the expenses for water alone per horse-hour	1448	1448	1399	1351
Total of the other expenses equally per horse-hour	0386	0241	0169	0097
Expenses for 1,500 *Hours* (5 *Hours per Diem.*)				
Items 5, 7 and 10, as above, together	$21 81	$27 32	$36 47	$48 80
Items 8 and 9, two-thirds of the above charges	4 67	5 63	7 24	10 45
Tax for water under pressure	54 28	108 57	209 89	405 30
Total annual expenses	$80 76	$141 52	$253 60	$464 55
Cost of running per horse-hour	2147	1882	1882	1544
Cost of water alone, as above, per horse-hour	1448	1448	1448	1351
Other charges per horse-hour	0700	0434	0434	0193

TABLE NO. III.—*Electric Motors.*

	¼ H.P.	½ H.P.	1 H.P.	2 H.P.	3 H.P.
1. Cost of the motor, including setting up	$63 93	$88 06	$106 15	$154 40	$197 83
2. Foundations, etc	5 79	6 76	8 44	12 06	15 68
3. Connections with the conductor main	15 68	17 61	21 23	23 16	25 33
4. Various expenses	2 41	2 90	3 62	4 83	6 03
Total expense of first establishing	$87 81	$115 33	$139 44	$194 45	$244 87
Cost of Running for 3,000 *Hours* (10 *Hours per Diem*).					
5. Interest, sinking fund and repairs, including the replacing of brushes—altogether about 14 per cent. of first establishing	$12 29	$16 15	$19 52	$27 22	$34 28
6. Net cost of current, with an average tension of 110 volts as a limit; consumption of current in amperes	3 amp.	5 amp.	9.05 amp.	18 amp.	26 amp.
Cost at a rate of $0.0193 per ampere-hour	$173 70	$289 50	$524 00	$1,042 20	$1,505 40
7. Oil and materials for lubricating	2 17	3 14	4 83	8 44	12 06
8. Overhauling and cleaning, as for the hydraulic motor	4 83	5 31	6 03	7 24	8 44
9. Miscellaneous expenses	4 83	6 03	7 24	9 65	12 06
Total running expenses	$197 72	$320 13	$561 62	$1,094 75	$1,572 24
Cost per horse-hour	2630	2123	1954	1834	1737
Cost of current alone per horse-hour	2316	1930	1834	1737	1665
Other expenses	0314	0193	0121	0097	0072
Cost of Running for 1,500 *Hours* (5 *Hours per Diem*).					
Interest, sinking fund and repairs	$12 29	$16 15	$19 52	$27 22	$34 28
Current	86 85	144 75	262 00	521 10	752 70
Miscellaneous expenses	4 83	6 03	7 24	9 65	12 06
Oiling and overhauling (items 7 and 8)	4 59	5 55	7 24	10 37	13 75
Total annual expenses	$108 56	$172 48	$297 00	$568 34	$812 79
Cost per horse-hour	2895	2292	2051	1906	1809
Taking the below prices for sale of current in Berlin electric works—					
a. Land tax per month	$0 724	$1 33	$2 41	$4 58	$6 76
b. Cost of current per hour	0723	0499	0917	1737	2533
We get the following costs for the current	90 47	166 46	288 78	501 80	733 88
Cost per horse-hour for 3,000 hours	1520	1303	1086	0965	0893
Cost per horse-hour for 1,500 hours	1785	1472	1182	1013	0941

TABLE NO. IV.—*Compressed Air Motors of Paris.*

	Without Regulator.		With Regulator and Single Expansion Gear.				
	½ H.P.	¾ H.P.	1 H.P.	2 H.P.	3 H.P.	4 H.P.	6 H.P.
1. Cost of motor, including transportation and setting up	$75 99	$112 18	$185 76	$222 69	$259 59	$291 67	$345 71
2. Expenses connected with starting	5 79	6 76	8 44	12 06	15 68	19 30	26 54
3. Pipe connections with the city system, including pressure regulator (without an air meteter) $12.06 + 5 per cent. of cost of motor	15 68	17 61	21 23	23 16	24 85	26 54	29 19
4. To heating the air, and other accessories	14 48	17 37	21 71	29 92	32 07	35 95	42 70
Total expense of first starting	$111 94	$153 92	$237 14	$287 83	$332 19	$373 46	$444 14
Cost of Running for 3,000 *Hrs.* (10 *Hrs. per Diem.*)							
5. Interest, sinking fund and repairs—11 per cent. of above total	$12 31	$16 93	$26 09	$31 66	$36 54	$41 08	$48 86
6. Cost of compressed air— Consumption compressed air per horse hour.	2,472.155 c.ft	2,118.9 c.ft.	1589.243 c.ft.	1,412.66 c. ft.	1,236.078 c.ft	1,130.128 c.ft	882.913 c.ft.
Annual cost for 3,000 hours, at a rate of $0.08197 per 1,000 cu. ft. for compressed air.	$151 99	$260 55	$390 83	$694 80	$911 93	$1,111 68	$1,302 75
7. Consumption of fuel in heating the air	00241	00241	00217	00217	00193	00169	00145
(Per horse-hour, about $0.00193, at a rate of $3.86 per barrel of oil)	1 81	3 62	6 51	13 03	17 37	20 27	For 1 horse-hour. 26 06
8. Oiling and tending per hour	00169	00217	00302	00483	00663	00344	01206
" " " " year	5 07	6 51	9 05	14 49	19 89	25 32	36 18
9. Overhauling and cleaning, at $0.0965 per hour, for 150 to 225 hours per year	14 48	14 96	15 68	17 37	19 06	20 75	24 13
10. Rent, hire of comp. air meter, light, insurance, and miscellaneous expenses	10 86	11 58	12 55	14 72	16 89	19 06	23 40
Total running expenses	$196 52	$314 15	$460 71	$786 07	$1,021 68	$1,238 16	$1,461 38
Cost per horse-hour	2630	2099	1544	1303	1134	1037	0820
Cost of air and fuel per horse-hour	2051	1761	1327	1182	1037	0941	0748
Other expenses	0579	0338	0217	0121	0097	0097	0072
Cost of Running for 1,500 *Hrs.* (5 *Hrs. per Diem*).							
Interest, etc., as above	$12 30	$16 90	$26 06	$31 60	$36 45	$41 02	$48 80
Consumption of air	75 93	130 28	195 41	347 40	455 96	555 84	651 38
Fuel for heating	97	1 93	3 38	6 51	8 69	10 13	13 03
Oil, materials for cleaning, overhauling and clean'g.	13 03	14 23	16 41	21 23	26 06	30 88	40 05
Miscellaneous expenses (as in item 10 above)	10 86	11 58	12 55	14 72	16 89	19 06	23 40
Total running expenses	$113 09	$174 92	$253 81	$421 46	$544 05	$656 93	$776 66
Cost per horse-hour	3016	2340	1689	1399	1206	1086	0869
Cost of air and heating alone	2051	1761	1327	1182	1037	0941	0748
Other expenses	0965	0579	0362	0217	0169	0145	0121

cities where water is distribted by private companies or by municipal water works.

Remarks on Table No. III.—Electric Motors.—I have taken into account only the charges for the sale of the current that obtain either in Barmen or in the electric works of Berlin, in spite of having many others placed at my disposal. The town of Barmen sells the current at the same rate both for motors and for lighting purposes, making no reduction either for the one or for the other. But this tariff, as far as the current intended for motors is concerned, is excessive and consequently necessitates considerable expense in running. The charges in Berlin are more moderate. Apparently this cheapness prevails at those electric works which do not themselves consume all the current that they can produce.

Remarks on Table No. IV.—Compressed-air Motors.—These calculations have been worked out upon the established rates of the city of Paris as a base, and may be regarded as a supplement to the general remarks made formerly in the numerous papers of M. Riedler. As this table indicates, the expenses of running a plant must be considered as very high. Perhaps the conditions may be more favorable when the central station in Paris is improved, and the price at which the compressed air is sold has been considerably diminished. The calculations of M. Riedler, relative to the expenses of production of compressed air, fully justify these conclusions. The net costs of running for a period of five hours of service are not exact except in case there be no interruption.

[To be concluded.]

THE iron roof for the storehouse which the U. S. Government is building at Willett's Point, L. I., will be furnished by the Berlin Iron Bridge Company, of East Berlin, Conn.

How to Get Paying Loads For Stations.

[A Paper read by Prof. W. D.. Marks, at the Seventh Annual Convention of the Association of Edison Illuminating Companies.]

When the constructing engineer, who may be called the organ builder, has completed the station, he will, if he is fond of his own ease and can afford it, give way to the general manager or engineer, who stands toward him in the relation of the organ grinder.

The manager, if he has not had previous experience, soon finds that he must combine with his knowledge as an engineer the energy of a locomotive, the activity of the Devil, the sleepless vigilance of Cerberus and the manners of a courtier. In days of prosperity and smooth running his board of directors will gladly share with him the credit and glory of success; in fact, very few will hear of him at all; but let anything go wrong, let a break-down occur, or the enterprise not prove profitable, there is but one man to blame—the general manager. It is proper to say right here that this opinion is the result of observation and not of personal experience. The writer desires to express his grateful appreciation of the uniform courtesy and assistance he has received from his own board of directors *who have patiently waited for two and a half years for a dividend now fairly in sight for the first time.* But this is, unfortunately, not generally the case.

Those of you who are familiar with the history of central stations know how frequently your kindly inquiries after the manager of early days is answered by "He is dead," "He is in the insane asylum" or "I don't know where he is; he couldn't make the station pay and resigned." These few words form the epitaph of many an able manager who has bravely struggled on against overwhelming difficulties and become discouraged, to be succeeded by another and perhaps another, until the public, becoming acquainted with the light, and sure of its perman-

ency, have taken it in sufficient quantity to pay the running expenses of the station, after which the progress and profits rapidly increase. The fortunate manager who came in at that period of the company's history had but to look sharply after the machinery, give a thoroughly good light and make prompt collections, to give great satisfaction to a body of stockholders who had invested their money for the purpose of obtaining dividends, and as one of ours told me, "are in this business for money."

The question, "How are we to reach this happy condition of affairs in the briefest space of time?" is proposed for discussion. I know that many of my hearers are doubtless quite as well able to discuss it as I am, but they may not have had quite the same conditions to deal with, and I may, therefore, hope to interest them in my different experience and expedients.

First of all, the story of the Philadelphia station is not a mere theory. We have a good paying load of 64,000 sixteens and only half the machinery in. The station is designed to carry 80,000 lights burning at once, and we can, when the station is completed, wire 150,000 lights and carry them, basing our estimate on Philadelphia's average burning in the past.

The price of gas is $1.50 per 1,000, which is the same as three-quarters of a cent per 16-candle lamp hour. We fixed the price at 1½ cents per lamp hour at the start, and we ran from March 5 to October 1, 1889, with rather poor success in obtaining lighting. The price was the same as gas at $2.25 per 1,000. We had to acknowledge that electricity cost more than gas and that it was a luxury. After a few months we fixed the price at three-quarters of a cent per lamp hour, and directed our agents to say that our light cost just the same as gas and was vastly better and more healthful.

This change was brought about by Mr. Edison's influence. I had had several conversations with him, and he always advocated meeting the price of gas squarely. I finally laid his views before our Board of Directors and they adopted the price named by him. There was an immediate change. The simple statement, "It costs no more than gas," brought many consumers to us who had heretofore refused to consider the matter of using electricity. We do no free house wiring, but we at first furnished service, meter and lamps free of charge. We did this till October 15, 1890; after that we furnished only a meter free, and the consumer paid for service and the first installation of lamps. We still renew lamps free of charge when not broken. We prefer not to do house wiring or to sell any particular make of motor. We got out elaborate rules and tables for house wiring, and established an inspection department, and insisted on the rules being obeyed to the letter. We urged upon the gas fixture men of Philadelphia the establishment of wiring departments, and we wrote to all motor firms we heard of, asking them to appoint agents in Philadelphia.

This has resulted in the establishment of 13 wiring firms, and the appointment of agents for 19 motors of different types. We had thus obtained 32 canvassing agents, who made a profit if they secured customers for us, but who did not get salaries from the Philadelphia company.

We paid 15 cents premium for all lights secured, and $1.50 per horse power on all motors when the current was turned on.

Each one of our 32 free lance agents had his own circle of acquaintance and lines of influence.

No injustice is done in saying that new things meet with twice the opposition in Philadelphia that they find elsewhere. But this body of canvassers was invincible. If we heard, or thought we heard, of a man who wanted light or power, we sent a card to each of the 32 firms, and before night that man had surrendered or left town. Very few escaped us. We had tin flags painted red and put on the end of a pointed iron bar, and on these was painted. "The Edison Electric Light Company. Apply for services at 909 Sansom St." At night we guarded our ditches by hanging lanterns on hooks on these flags, and in the daytime we left them standing without the lanterns. We advertised every ditch and line of conductors this way. We did not adver tise steadily in the newspapers, but we distributed throughout our districts thousands of circulars, giving all the information that an intending customer could possibly want.

We had but one salaried agent as solicitor; he also received a commission on lamps and motors, and earned, I think, three or four thousands in addition to his salary in one year.

Every form of advertising and solicitation paid, and paid well, but the best advertisement of all is a satisfied customer. Give a customer an honest 16 or 17 candles all the time, but no more, charge him the fixed rate and stand by the meter record. The meters have proved practically correct; if they err at all, it is against the company, because of overloading. Our meter plates are always weighed in succession by two independent weighers, this work keeping them busy all the time for 1,100 customers.

All of the staff of employees are instructed to be uniformly polite and reticent, no matter how unreasonable the customer may be. If a bill is disputed, we test out the wiring for grounds or crosses and go over all of our meter calculations again. If there still appears the slightest ground for just complaint, an inspector is detailed to keep a lamp hour record by actual count. We never have found our meters to overcharge the consumers.

If a complaint is made of a motor bill, we pursue a similar course, and also, by means of an ampere meter, test the current. We frequently find motors loaded to twice their rated capacity. If we are satisfied that we are correct, we notify the consumer that 15 days after date of bill he will be cut off, and do it, and sue him for the bill. If a customer does not pay his bill in 15 days, the chances of his doing it at all are very slight, and it's no use talking to him after a bill gets old.

Our general agent visits in person many of our consumers who have by misconception felt themselves aggrieved, and we find that a pleasant discussion and explanation of the matter in dispute almost invariably ends in a clear and cordial understanding with our customer.

We try to be unfailingly just with our consumers, regardless of consequences to ourselves, and we feel now that they believe in us.

We sell power to all 110 volt motors at lamp rates. For 220 volt motors our rate is 7½ cents per horse power hour. If a consumer takes more than 1,000 horse power hours and less than 1,500, we fix the price at $75 for four weeks.

All power above 1,500 is sold at 5 cents per horse power hour.

Contracts vs. Meters.—The question at once arises in the minds of many of my colleagues, "Why not sell light, or at least power, by contract, instead of meters?"

The answer is, because in the long run it is less profitable, and overloads the station too quickly.

You will recall how our energetic band of 32 canvassers was secured by taking advantage of their desire to make money.

The underlying law of all business is selfish money getting or saving.

Without being deliberately and intentionally dishonest, nine consumers out of ten will fail to keep within the limitations of a contract for light or power; they will forget to turn out lights and to stop motors unless they are reminded of any oversight of this sort by the regular presentation of their meter bills. Making contract consumers pay for lamps does not seem to check them, they simply growl about the short life and price of the lamp; besides, these frequent small charges for lamps serve as a constant irritant to consumers and provoke much criticism of the lamps. Still, the meter alone without any contract has its disadvantages.

When we were furnishing lamps free of charge, a gentleman on Rittenhouse Square put 400 lights into his dwelling and paid us by meter bills $800 the first year, $2 per lamp per year only, and we had furnished free service, free meter and free lamps; certainly not a profitable investment. So we now make all consumers guarantee us 6 cents per lamp per week and only put in a free meter, and cut out and renew lamps free. If the lamps are burned on an average more than 6 cents worth a week, a meter bill is rendered. This insures a minimum earning power for each lamp of $3.13 per year and does not frighten consumers away.

It would appear from our experience as though light consumers were profitable in the following order, although no rigid classification is possible:

Restaurants, gambling houses, etc., clubs for social purposes, hotels, newspaper and telegraph offices, theaters and opera houses, small factories and business houses, stores for sale of drygoods, etc., buildings used for offices, dwelling houses, Protestant churches.

The latter being open only on Sunday and a few evenings in the week, and on these for a few hours, should never be lit without a contract insuring the earning power of the lamps. The only advantage that can be claimed by churches is, that they burn light when almost every one else does not do so.

At the start we heard a great deal of special inducements to be offered to consumers who use light and power "out of hours"—that is, before 5 and after 11 P. M. and on Sundays.

With the exception of printing offices and churches, there are very few of these consumers.

It is certainly advantageous to get them, but they do not exist in large numbers. Motors which run during the day, say from 7 A. M. to 6 P. M., are advantageous as giving the machinery of the station a uniform load, but in winter when the lighting begins at 4:30 P. M. they overlap

the lighting load, making a maximum load occurring between 5 and 6 P. M., and sometimes a very high maximum as compared with the average load.

Small factories, business houses, stores and buildings used for offices closing at 6 P. M., all add largely to this maximum load without burning on an average more than 1½ hours in 24, and for this reason should not form too large a proportion of the station load.

We have endeavored in every way to increase the sales of our current, and for this reason we have sold all supplies required by wiremen at 8 per cent. advance on their net price, as billed to us; thus reducing the cost of wiring. We believe results to have shown this to be a proper policy.

We have endeavored, by concentrating all our machinery into a single station of large capacity, to obtain great economy of running expenses, and to enable the employment of the best possible men in each special department.

All and every expense of running included, it costs us from $2.50 to $3 per lamp per year, and we obtain a revenue of about $5 per year from each lamp.

A subject of anxious thought to all managers is how to increase this revenue per lamp.

By getting lamps that burn long hours, is the answer, or by getting motors for day service.

But motors do not pay as high rate for current as lamps, and people who burn light long hours will put in an isolated plant if they have more than a very few lamps.

I cannot give my own views better than to repeat to you my letter of February 17, 1891, addressed to our board of directors.

PHILADELPHIA, February 17, 1891.

To the President and the Board of Directors of The Edison Electric Light Company of Philadelphia.

Gentlemen: Touching the matter of the cost and the selling price of electric light and power, it seems to your engineer and manager that with the near approach of the limit of our present machinery and building capacity, he should lay before you his views in detail as to the proper method of dealing with our consumers, which, while equitable to all, he hopes will result in increased daily profit to the company.

At present, on an average, all of our lights and motors are profitable to us, costing us about $\frac{3.5}{100}$ of a cent, and being sold at from one-half of a cent to three-quarters of a cent per lamp hour. Had we storage capacity for electricity, as has a gas works, we would be able to continue all and increase indefinitely until the full capacity of our feeders, 50,000 lamps burning at once, or say 100,000 lights wired, had been reached; as it is, we must stop when we reach 14,000 amperes, or about 30,800 sixteen candle-power lamps burning at once. This would appear to be the case when we have 67,500 lamps wired.

While all of our lamps are profitable to us, as stated above, still, there being a limit to the number attached, there must be a sufficient margin of profit, on the average, to enable us to meet the demands for dividends, interest on and sinking fund for debenture bonds. We can neglect our floating indebtedness, as I am advised that there are enough quick assets to cover this.

Thus we have to meet the following demands the first year:

Sinking fund to retire debentures	$37,500
5 per cent. premium on the same	1,875
Interest on $300,000 at 6 per cent	18,000
Dividend, 6 per cent. on $1,000,000 stock	60,000
	$117,375
Amount cash surplus required each month	$9,781 25
The cash surplus for January is	12,766 69

Thus you will see that this company is already on a dividend earning basis.

As the sale of merchandise and isolated plants forms but a small part of the duties of those employees having the care of it and will not increase, we can neglect it as not forming a separate and important item.

We have connected 55,064 sixteen candle-power lamps, and our gross income is $28,507.09, yielding us 51 $\frac{4}{10}$ cents per lamp per month, or $1\frac{7}{10}\frac{1}{5}$ cents per lamp per day, the average burning of each lamp being $2\frac{6}{10}\frac{6}{5}$ hours.

This gives us an average selling price of $\frac{6.5.5}{1000}$ of a cent per lamp hour.

Then for each 16 candle-power lamp we have,

Average income	$1\frac{7}{100}$	cts.	per day.
" cost $2\frac{5.5}{100}$ hours at $\frac{3.4.5}{1000}$ cts	$\frac{3.9}{100}$	"	"
" profit per lamp	$\frac{8.3}{100}$	"	"

Thus we see that we have reached a moderate dividend earning basis with an average profit of $\frac{8.3}{100}$ of a cent per lamp per day, but the risk of the business and the long delay in obtaining any return for capital invested should make us give careful thought to any scheme which promises to enable us to obtain larger dividends.

Each director has offered to him an elaborate analysis of the record of each consumer, and those that are interested can judge for themselves of their value

Assuming now that it is decided not to continue lights yielding less than .82 of a cent. profit per day and thereby to raise the average above the present, we can construct the following table of prices yielding the same profit each day:

Selling at per Lamp Hour.	Profit per Hour.	Hours Burning Required.	Discount from ¼c. Per Cent.
.40 c.	.05 c.	16 to 24	47
.45	.10	8 to 16	40
.50	.15	5 to 8	33⅓
.55	.20	4 to 5	27
.60	.25	3 to 4	20
.65	.30	2½ to 3	13
.70	.35	2⅓ to 2½	6
.75	.40	2 to 2⅓	P'm on ¼c.
.80	.45	1.75 to 2	7
.85	.50	1.64 to 1.75	13
.90	.55	1.50 to 1.64	20
.95	.60	1.36 to 1.50	27
1 cent.	.65	1.25 to 1.36	33⅓

In the above statement the hours are given only with sufficient approximation for ousiness purposes.

The cost of lamps is about one-seventh the running expense of the station and, therefore, the cost of a horse power hour is 4½ cents. You are aware that we sell at 7½ cents, save in cases where a consumer uses more than 1,000 horse power hours in four weeks, in which case he gets his power at 5 cents per horse power hour for the some reason and upon the principles which I have set forth in the case of lamps.

Careful consideration of the table will convince you that there are cases of burning long hours in which apparently great concessions in price will result profitably to this company, and on the other hand, that there are consumers burning short hours who should be charged a higher price than three-quarters of a cent or not be taken at all.

For instance the Bullitt building should be charged 1 cent per lamp hour to bring it to the average.

The Aldine hotel averaged a return of $\frac{5.5}{100}$ of a cent the first year, but this year has been using the light extravagantly. Its contract should be terminated next September, and no contracts taken based on the former gas bills in any instance.

Besides the greater profit of long hours, there are many advantages to the machinery, apparent only to the engineer, which he will not state here.

Since the special order of this Board, of something more than a year ago, directing your engineer and manager to make all contracts for light and power, he has been guided by the principles set forth above, but now feeling that perhaps you would prefer to have others to undertake this work, he is impelled by his interest in the welfare of this company to enunciate them in writing and to beg your careful consideration of them before taking such action as might diminish the profits of this company

Very respectfully and truly yours,

[Signed] WM. D. MARKS, Supervising Eng'r and Gen'l Man'r.

It is proper to add that we have not a dozen cases in our 1,100 consumers in which any concession is made, and that we are actively engaged in getting rid of them, as full rate consumers offer themselves.

We have had elaborate analyses of the value of each consumer made and know exactly what he is worth to us.

It does not properly come within our province in this paper to discuss economy of production, but I will state what are the principles upon which the erection of the Philadelphia station was based.

Concentration of power, economy of running expenses, simplicity of design, certainty and regularity of action of machinery.

We use Armington & Sims' single cylinder engines, making 220 revolutions and developing 440 horse power at 150 pounds of steam one-quarter cut off.

They have performed very satisfactorily, doing all that was promised for them.

Our dynamos are No. 60 Edison type, making 400 revolutions and developing 1,000 amperes each. They have performed to our entire satisfaction, giving us great comfort since replacing iron bearings by

phosphor-bronze. They will pull a station through any short circuit that can occur.

Our underground system remains practically perfect wherever we have used the Kruesi tube or the Edison system. Cables, whether lead covered or not, have given us great trouble and expense where we have been forced by the city authorities to pull them into wooden conduits.

It is far better to bury a cable in the ground than to put it into a street conduit which is not hermetically sealed.

Our services are three wire lead covered cables buried in the ground, and of the many hundreds now in I cannot recall a single instance of trouble from them.

To resume, in brief, I would say:

Put the price of light and power as low as you can, and thereby secure the permanency of your business as against competition. Do no free house wiring, but get others to do your wiring and make it profitable to them by offering premiums, if necessary. Put no free lamps in first installation, but renew them free of charge. Own your own meter and service. It is not good policy to let the consumer own the service. Do not try to sell any particular make of motor, and be careful not to express any preference. Offer premiums to agents. Sell current by meter, but have a minimum contract price to insure earning power of lamps and motors. Above all things, always give a good light, but not an excessive amount of it. Don't talk with or write to consumers in a threatening way, who don't pay promptly. Stand by the meter and cut off the light. Be open and courteous in acknowledgment of errors and repair any injurys unwittingly inflicted, regardless of consequences to yourself or the company. Don't believe the statements of consumers until fully verified.

At the end of the second year from the start we find our Philadelphia Company on a solid dividend paying basis.

In any other enterprise of equal magnitude this would be called a great success.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, Nov. 10, 1891.

Gas and Ventilation.—Mr. Preece on the Cost of Electricity and Gas.—Increased Cost of Coal and Labor.

An important lecture on the subject of modern ventilation was recently delivered before the Association of Public Sanitary Inspectors of Great Britain, by Mr. J. F. Simmance, and it is especially interesting to gas engineers on account of the intimate way in which gas as used for lighting is woven into the subject. It is all very well for electricians to talk of the air vitiating effects of combustibles used for lighting, but the fact remains that, while electric lamps at best can be only neutral, whether the gas is hurtful on the one hand, or an efficient ventilating agent on the other, depends entirely on the way in which it is used. After a very interesting general account of the actual requirements conceived in good ventilation, the lecturer goes on to say that the utilization of the heat given off by the gas used for lighting is cheap, automatic, and suitable for all kinds of buildings; and states definitely that the amount of gas necessary for the adequate lighting of a room is also ample for its complete ventilation. This does not touch upon the use of gas as a ventilating agent only during the hours of daylight, and the economy of such as compared with other special agents. At the price of gas as supplied in our large towns, no question is likely to arise on this head, and it might almost be said that the advantage of gas for this purpose is generally well known. Mr. William Sugg and others have repeatedly shown that a comparatively small quantity of gas, consumed at the lower end of a properly arranged upcast shaft, is capable of doing a large amount of work in the way of ventilation. Mr. Simmance considers that the subject has not received sufficient attention, and enumerates some of the difficulties that have been experienced; but states that with a properly arranged system these faults are non-existent, the installation is cheap, and the results satisfactory. Good light, and good air, are secured, and the ceilings and decorations preserved. The principal features of such a system are indicated at some length, and as a practical example the arrangements at the Grosvenor Museum, Chester (carried out by Messrs W. Sugg & Co.), are described in detail. All who wish to read an excellent paper, full of practical details on this important subject, will do well to obtain a copy of the full text of this interesting lecture. It is well to remember that it is in cold climates, or during cold weather, that the aid of artificial ventilation is chiefly in request. During the summer, or in warm countries, windows and doors are left open to the outer air. So that the question of ventilation may well be associated with heating and lighting agents.

One of our celebrated novelists has depicted a personage who could prove anything and was always right in his own estimation, and who had such a keen insight into things that a knowledge of the facts relating to any particular subject under discussion was quite superfluous. It is said of him, in the course of the story, that on one occasion he took out his watch and said that if the sun did not rise in a minute and a half it would be late. Had the story been written at the present time, instead of several years ago, I should have imagined that the author had, shortly before draughting out that particular character, enjoyed the honor of hearing the lecture on the relative cost of gas and electricity by Mr. W. H. Preece, which is reproduced in your issue for the 19th ult. Mr. Preece believes that electricity is cheaper than gas, and all facts relative to the matter that do not support this view must give way to reckless assertion. It is no use for actual users of electricity to write to the *Times* and say that the cost of each electric lamp per annum is more than 30 shillings, and not less than 10 shillings, as asserted by Mr. Preece. It is no use to point to the fact that our principal streets are lined, one may say, with gas lamps of the regenerator pattern and other approved modern types, securing a practical duty of 5, 7, or even 10 candles per cubic foot of gas consumed, when it suits Mr. Preece to say that gas consumers prefer old-fashioned iron tips, giving a practical duty of 2 candles per cubic foot. For some years past Mr. Preece's utterances on the cost of electricity as compared with that of gas, which are trotted out on every possible occasion, in season and out of season, have been a matter of amusement, not to say ridicule. The actual cost of producing and distributing electricity is generally known, so that no one is likely to be caught with Mr. Preece's special pleading, and it would not be necessary for me to notice the paper but for the fact that it grossly misrepresents, in several respects, the state of gas matters in England. It is my object to place these before you as plainly and squarely as possible, and, therefore, I enter upon the unthankful office of correcting a few of Mr. Preece's blunders.

In passing, we may notice the fact that Mr. Preece has added to his other eccentricities a claim to be considered as a practical man, and a gas shareholder, whilst he repudiates the title of an enthusiastic electrician, which is generally attached to him, and will stick nevertheless. He has said so much about the vileness of gas and its bad effects on health if not on life itself, that in declaring himself a gas shareholder he stands in the same position as a rabid teetotaller who is the proprietor of shares in a brewery company. He is making a profit out of a thing that he condemns. But I do not press this point, because it will be obvious to all careful readers of the paper that his interests in gas are a mere trifle as compared with those in electric companies.

Mr. Preece takes the case of Manchester as a means of getting at the cost of gas, "for the single reason that he has more authentic records of what is done there than in any other town." As a matter of fact, copies of the credited accounts—and it is impossible to have more authenticated records—of every statutory undertaking in the United Kingdom are readily obtainable. From subsequent remarks about the control exercised by the Board of Trade over *electric* accounts, it may be gathered that these are not altogether reliable, and so it is desirable to point out that the Board of Trade exercise equal vigilance with regard to all the undertakings that come under their cognizance. They do not single out electric companies, or any other class, for special attention. So Manchester is probably selected because it suited best for the object in view. The statement that the average quality of gas supplied throughout the country is not over 15 candles is simply false. Every company has its fixed standard, that the gas must never fall below a certain limit, usually 16 candles, but 14 or even 12 in some of the older Acts. Mr. Preece has probably confused this limit with that actually supplied as shown by the official tests. By consulting those he will learn that a 16-candle standard means 17½ candles in practice, and that many companies who are only bound to supply 12, actually send out 16-candle gas. In fact, there is not much gas of less than 16-candle power made in England; many other towns besides Manchester give 20-candle gas, and the average for the country is more like 18 than 15 candles.

Some years ago a gas engineer read a paper descriptive of a special apparatus, and as a means of showing its value, quoted figures from the yearly working at the gas works where it had been fixed, before and after the supplying of the apparatus. The inference, of course, was that the improved results shown in the later period were entirely due to the apparatus in question. But unfortunately for this argument, a gentleman intimately acquainted with the neighborhood spoke in the course of the subsequent discussion, and mentioned that at the time of fixing the specialty which was the subject of the paper, the whole plant had been

reconstructed, and he wished to know how much of the improved results were due to the general reconstruction. Mr. Preece is very fond of talking about the great benefit of substituting electric light for gas at the general post office. His descriptions of the ill-heath, etc., due to the use of gas are so harrowing as almost to suggest some great neglect in the matter of providing proper appliances and proper ventilation at this great public establishment. All our other government offices have been, and with few exceptions still are, lighted by gas, and that without any of the evils so pathetically related by Mr. Preece. Be that as it may, however, in this matter there seems to be a need for the well informed and independent observer, who can tell us about the other reforms that have been affected at the post office concurrently with the introduction of electricity as a lighting agent—what enlargements of premises, improvements in ventilation, re-arrangement of working hours and increase in wages have been granted. These and many other things all have their influence on the average hours of absence.

I will not attempt to follow the intricate argument by which it is sought to prove that gas consumers allow 20 per cent. of their gas to burn to waste, for the simple reason that the majority exercise ordinary care to prevent waste. It is quite incomprehensible how people that are too lazy to turn out the gas, are suddenly to be converted to a proper care over the electricity switch. Mr. Preece's argument appears to be based on public lighting data, which can have no bearing whatever upon private lighting. His data as to the cost per lamp are equally fallacious. It is the custom to reduce electric lighting to an 8 candle standard, so that an electric company supplying 1,000 64 candle lamps would take credit for 8,000 lamps. But there is no corresponding rule in the case of gas, and the returns for gas lamps include 50, 100, and 200 candle lights. So that any data as to cost per lamp are entirely fallacious and misleading.

The increased price of coal which seems likely to become, to a great extent at any rate, a permanent feature with us, a stimulant in the acts as direction of improved modes of carbonizing and also in the utilization of other materials. Coal seems fixed at a price some 25 per cent. higher than that which has obtained since the coal famine of 1873, and only a comparatively small proportion of this is recoverable by way of the residuals. Coke is certainly in excellent demand, and is especially coming into favor for household use, but against this, both tar and ammonia are dull, and prices are falling. In addition there is the increased cost of wages to contend with. Substantial rises have lately been the rule. So that altogether gas engineers find themselves in the position of being called on to make bricks without straw. Increased rates for gas are not welcome and they are pressed to keep the working expenses as low as before. Whether this condition of things will be beneficial, on the whole, remains to be seen.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE appointment of Mr. J. A. Bostwick to the Presidency of the Standard Gas Light Company of this city has been followed by the appointment of Mr. Edwin Ludlam to the position of General Manager of the Company. Mr. Ludlam, who was President of the Peoples Gas Light Company, of Brooklyn, for many years, resigned from that Company so that he might devote his entire time to the duties of his new position.

MR. G. B. HAND, Secretary of the Scranton and Hyde Park (Pa.) Gas and Water Company, is again to the fore with an announcement of a concession in gas rates. On November 15th the following notice respecting the concession was published in the local newspapers: "In pursuance of the long-continued policy of these Companies to reduce rates from time to time, as may be warranted by the increased consumption notice is hereby given that from January 1, 1892, the price of gas will be $1.40 per 1,000 cubic feet consumed, subject to the following discounts: 10 per cent. on all bills where the consumption for the month amounts to less than $25; 15 per cent. on all bills where the consumption for the month amounts to $25 and upwards, provided the bills are paid on or before the 20th day of the month in which the bill is presented."

THIS is in strict accordance with the policy of the proprietors of the Company, inaugurated by them some years ago and steadfastly adhered to. It goes without saying that gas at $1.26 per 1,000 to the ordinary consumer in a place of the size of Scranton is very cheap and the length of the discount period is also noteworthy.

THE San Antonio (Cal.) Electric Light and Power Company offers to supply 16 candle-power incadescent electric lights at the rate of $1 per month each on a service beginning at dusk and terminating at 9 P. M., the charge to be $1.50 per lamp when the service is carried to midnight.

WE are in receipt of the following from a correspondent at Cincinnati, Ohio: "A resident of Clifton took the following unique way of exposing a fraud to General Hickenlooper in a letter to him: 'My dear General: On Monday evening last a Bedouin in the guise of a saver of gas called at my house on Clifton avenue and tried to sell me a patent burner fixed up with a ground glass shade, etc. The burner was of a kind that will reduce everything, from inflammation of the brain to the size of your gas bill. He kindly offered to sell me a couple of these contrivances for a $5 William. He then asked me if I was in any way connected with the Gas Company, and on learning that I was not the present owner of the plant, he said he would show me how I could fix the meter so that it would not register over 50 to 75 cents worth of gas per month. He volunteered the information that he had offered this scheme to a number of people in the city and suburbs, and that he was working Clifton. Upon my telling him that I preferred paying the Gas Company for the gas consumed, not so much for its intrinsic value but simply as an evidence of good faith, etc., he became a little discouraged and inquiring the name of my nearest neighbor he wafted himself off the front porch and was seen no more. He is about 55 years of age, has a full beard, wears glasses, and a plug hat of the vintage of '64. I do not know whether there is anything in his scheme, but I thought you might as well get acquainted with him through Deitsch's introducing bureau.'"

THE following notice recently issued to the gas consumers of Chillicothe, Ohio, by the proprietors of the Chillicothe Gas Light and Water Company, speaks for itself, and for the careful management of President F. A. Stacey and Secretary A. C. Kopp as well: "The Chillicothe Gas Light and Water Company during the past summer have been remodeling and improving their gas works, putting in new machinery, so that they are now prepared to meet any demand for gas that may be made upon them. Pursuing a true business policy and with an eye to increasing the consumption of gas, the Company propose to share the benefits arising therefrom with the consumers. With this idea in view they make the following announcement, viz.: For and after the month of November, 1891, the price of gas on monthly bills will be $2 per 1,000 cubic feet, on which, in consideration of prompt payment, and only in consideration of such payment, the following discounts will be allowed: On monthly bills of from 1,000 to 5,000 cubic feet, 25 cents per 1,000; on monthly bills from 5,000 to 10,000 cubic feet, 40 cents per 1,000; on monthly bills of 10,000 or over, 50 cents per 1,000. Where meters are set and not registering, 100 cubic feet will be charged for, and if not paid the meter will be removed. This action has been made necessary from the fact that if a meter is not put in use after it has been set, and having the pressure of gas upon it it, becomes worthless in the course of two or three years. As the consumption of gas for cooking and heating is on the increase, gas stoves will be sold by the Company at cost and special rates for such use will be given on application at the office, 36 West Second Street. It is to be hoped that the public will generously appreciate this very considerable reduction, and the Company on their part will furnish plenty of gas of good quality."

AND the public will surely appreciate such attempts to give it better gas service at a reduced rate.

MR. F. A. FRINK is no longer in the service of the Clinton (Iowa) Gas Company.

SUPPLEMENTING our extracts (issues of Sept. 7 and October 26, respectively) from letters received from Mr. Sylvester Watts by a New York friend of that gentleman, we give the following, taken from a letter written by Mr. Watts at Vienna, under date of the 6th inst.:

"Mr. * * * —Dear Sir: Since I wrote you from Rome I visited Naples, Alexandria, Cairo, Athens, Constantinople, Buda-Pesth, and am now at Vienna. When I arrived at Cairo I learned that, owing to the prevalence of cholera in Palestine, no vessels from Egypt would stop at Jaffa or Beirut, so I had to abandon the trip to Palestine, and you will be minus the bottle of Jordan water. Naples, which is a city of 500,000 inhabitants, is being rebuilt in modern style. The gas works are owned by a French Company. They carbonize about 45,000 tons of English coal per year. Bench settings are all old style—the demand for coke and tar being limited there is no occasion to put in regenerative furnaces, and the tar and breeze are used for firing. The price of gas is about $1.10 per 1,000. The city streets are lighted exclusively with gas.

There are about 12,000 street lamps, through which about one-third of the whole output of gas is burned. The city pays about 80 cents per 1,000 for gas used in the lamps. Newcastle coal is used, costing about $5.60 per ton. At Cairo the gas works also belong to a French Company. They have 15 benches of sevens, in rather dilapidated condition. The purifiers are built of brick and cement, without roofs over them—roofs would be of no use, as it never rains. The city and the agricultural lands all depend on the rains that fall at the source of the Nile. The streets are all lighted with gas. It is not much used in the shops as the Oriental custom is to close the stores at dark. Athens which is quite a modern built city, contains about 110,000 inhabitants, has steam and horse tramways, fine parks, and steam rollers for rolling the rock and gravel paving. The population compares favorably in appearance with that in the cities in Central Europe. Part of an ancient aqueduct is used for conveying water to the city, where it is distributed in pipes. The gas works are owned by a French Company, and the same Company owns works at Brussels, and 40 cities in France. They carbonize at Athens about 10,000 tons of coal per year. Newcastle coal is used, and its cost is about $6 per ton. There are 15 benches of sevens, common settings, and the firing is done with tar and breeze. There is a good sale for coke, but little demand for tar. They sell about 80 per cent. of the coke made. The firemen get 65 cents per day, for 12 hours work, and there is one firemen to each bench. The mains are all cast iron, and jointed with a round rubber ring put on to the spigot and pressed into the bell end. No lead is used in joints, and rubber ring joints that have been in use for 12 years are perfectly tight. The streets are all lighted with gas. The general government have an arc electric plant and wires are strung through the principal streets, but the lamps are lighted only on fete days. Incandescent electrics are used in some hotels and restaurants. The gas works have been in operation about 12 years. The gas rate is about $1.10 per 1,000. The Oriental style of closing shops at dark has prevailed, but is being gradually changed. Buda-Pesth is the most modern looking town. Everything is done on the style of the most active American cities. The streets are broad and well paved with granite and asphalt, and well lighted with gas. The 5-jet Paris burners are used on street lamps. Regenerative gas burners on Siemens-Lungren plan are used very extensively in stores and hotels; also large numbers of incandescent gas burners. Propositions have been made by electric companies to light the streets with arcs, but so far the authorities do not care to change. The wages of firemen are from 75 cents to $1 per day, which is the prevailing amount paid in Europe. At Buda-Pesth, firemen who lose no time during the month are paid a bonus of $1.50 per month. The engineer of the works, Mr. Hoefer, is an American, formerly engaged in railway engineering in the United States. He gave me a very kindly reception, and was much pleased to find some one to talk 'American' to. He has in his charge four stations, situated on both sides of the Danube, containing in all about 700retorts, in settings of 7's and 9's, fired with half-depth regenerative furnaces constructed on his own plan. When working at full capacity he can fire with 14 per cent. of the coke made. He has 12,000 street lamps and 10,000 meters set, and the make amounts to about 700,000,000 cubic feet per year. The works are owned by an Austrian Company, whose headquarters are at Trieste. The Vienna Gas Company has seven stations, containing in all about 700 retorts, in settings of 8's and 9's, fired partly by half and partly by full regenerative furnaces. The full regeneratives are on the Stettiner plan, and are fired with 15 per cent. of the coke made. One fireman to each bench does all the work above the floor. Men below look after the clinkering. The firemen are paid 2½ florins per day, about $1.25 paper money, which is worth 15 per cent. below par. Regenerative and incandescent gas burners are being extensively introduced. Messrs. Welsbach & Williams, No. 4 Schlief-Muhlgasse, Vienna, are manufacturing, selling and renting the Welsbach burner, patented by Dr. Carl Auer von Welsbach. They have now out on the rental plan about 60,000 burners. They sell the burners to the gas consumers, and charge a rental of one kreutzer (one-half cent) per day for each burner. The consumer is at no further expense. The Welsbach & Williams Company furnish all mantles and keep the burners in order. No contracts are made for less than one year. They, however, sell burners, and mantles also, to any one who wishes to buy them. The mantles are sold at 30 cents each. The rental on 60,000 burners amounts to $300 per day—quite a nice little income. Our American Welsbach Company would find it very profitable to introduce the same system. Our Gas Associations should formulate some plan for the introduction of the most economical burners. Many have been of the opinion that such a course would reduce the output, but I think the output would be increased and as much profit realized, while better satisfaction would be given to consumers. * * *."

THE movement to place the Pulaski Gas Light Company, of Little Rock, Ark., in the hands of a receiver was not successful, and in short time the Company's affairs will be straightened ont.

A PROJECT for the establishment of a gas works at St. Joseph, Mich., is underway, the probability being that the capital for the same (it is proposed to expend $50,000) will be furnished by St. Louis parties. St. Joseph is in a similarly named township of Berrien County, Mich., at a point 22 miles northwest of Niles and 60 miles east by north of Chicago. It is at the mouth of the St. Joseph river, and is 2 miles southwest of Benton Harbor. It abounds in manufactories for small goods, and is the center of a very fertile fruit growing district. Population, about 5,000; of the township, about 7,800.

AMOS S. BROWNE, Clerk to the Board of Street Commissioners of Saratoga Springs, N. Y., has been instructed to correspond with the Saratoga Gas and Electric Light Company with a view of determining for what sum per month the Company will agree to maintain the following number and description of public lights: 200 arc electric lamps, 220 gas lamps, and 90 naphtha lamps.

JAS. W. FORBIS, Mayor of Greensboro, N. C., advertises for sealed bids for lighting that city "with electricity on and after April 15, 1892. Bids to be made upon an estimate of not less than 50 arc lights, of 1,500 candle power each; or with incadescent lamps of equivalent lighting capacity." The bids are to be made on all night lighting and on moon-table. The competition will close on February 1, 1892.

R. V. BOOTH, Mayor of Vicksburg, Miss., asks for sealed proposals for lighting the city of Vicksburg for a period of 1, 3 and 5 years, the competition to close on December 7. Detailing the items, the Mayor says: "The bid of the Gas Company to state the candle-power of each lamp, and bids to be made on 100, 125, 150 and 200 lamps, for 1, 3 and 5 years. The bids of the Electric Light Company to state the candle power of electric light, and bids to be made on 10, 20, 30, 40 and 60 electric lights for 1, 3 or 5 years.

WE are informed that the improvements at the plant of the Jamaica Plain (Mass.) works, which were carried out under the direction of Superintendent Rogers, are fully up to the results that their designers calculated they would produce.

IT is said that the Bay State Gas Company will, at the coming session of the Massachusetts Legislature, ask for permission to consolidate all of its local companies.

SUIT has been entered in the Superior Court of the district by the Fargo Gas Light and Coke Company, of North Dakota, against its successor, Fargo Gas Light and Electric Company. Plaintiff claims that part of the purchase price was covered by a note for $45,000 that has not been paid. The defense claims offsets.

UNDER the compromise ordinance—the outcome of conferences between the proprietors of the Pulaski Gas Light Company, of Little Rock, Ark., and the City Council, in respect to the renewal of the charter of the former—the Pulaski Company's charter is extended for 30 years, under the following conditions: That the Company pay to the city $500 per annum during the 30 years; that illuminating gas shall not cost more than $2, and fuel gas not more than $1.25 per 1,000 cubic feet, respectively; that the Company pay $1,000, on account of two annual payments, in advance, and that no meter rentals shall be charged.

A RECENT issue of the Pittsburg *Gazette* says that the 3 year contract between the city and the East End Electric Light Company will expire January 1, 1892, and adds that the Company will have to turn over several thousand dollars worth of the city's property at that time, which it has held for the past 3 years, in as good condition as when it was turned over to that corporation. The latter, for instance, agreed to take good care of the lamp posts formerly used on the streets now lighted by electricity. This has not been done, as many of these have been destroyed.

THE United Gas Improvement Company, of Philadelphia, has brought suit in the Circuit Court, of Duluth, Minn., against the Duluth Gas and Water Company, alleging infringement by it of the Lowe patents. Plaintiff asks for $100,000 damages on royalties account, together with the money value of the profits made by the Duluth Company accruing to the latter during its unlicensed use of the Lowe process.

A QUEER accident was reported recently from Anderson, Ind., where a dog in the house of A. W. Pachal turned a gas tap, the escape from which subsequently became ignited, causing the total destruction of the building by fire.

THE authorities of Binghamton, N. Y., are said to be considering the advisability of establishing a municipal electric lighting plant.

THE following letter from Mr. A. W. Tarbell, Manager of the Framingham Gas, Fuel and Power Company, of South Framingham, Mass., written under date of the 23d inst., goes to show that, even if the places named were not the most prominent ones in the town, the Company has many of the latter on its list. Mr. Tarbell says: "I was pleased to see that this Company received a notice among your items in the JOURNAL of last week (issue of November 16th), but was somewhat amused at what I could read between the lines. I don't know, of course, what your source of information was, but speaking of the Adams Express Company and J. H. Goodell's stable as among the largest business places here is hardly correct. The term will well apply to C. Folger's dry goods house, as he is using 40 of our burners for lighting purposes. Of the others, the former requires but 5 and the latter 3. The facts are that we are running here very successfully. The gas is giving excellent satisfaction to the consumers and we are increasing the business every month. During the quarter ending with this date, 50 meters have been added, and we now have a total in use of 175, while the total number of Welsbach burners 'on' figures nearly 1,000, and of stoves and fixtures for fuel purposes at 200. We are also supplying 4 large factories with gas for fuel and lighting purposes, and one other factory now building will use gas engines, etc., etc. Perhaps if the former item is amended by this information it will set us nearer right before the fraternity."

THE American Gas Company's absorption of the Eastchester Gas Light Company, Mt. Vernon, N. Y., has been so far marked by many important plant improvements. Among these it may be noted that the old 5 ft. 6 in. by 10 ft. purifiers and the 4 ft. station meter have, this season, been replaced by purifiers 16 feet square, and by an 8 ft. McDonald station meter, respectively, and with 12-inch connections throughout. To house these betterments an addition to the old building was erected, so that the present purifying house is 120 feet by 25 feet. The arrangement is believed to be somewhat of a novel one, and possesses some striking features. The boxes are set in a single row, with one crane travelling the length of the whole four, thus saving an expensive crane in the ordinary four-square method of setting. This method likewise, by being put in a long, narrow building, saved several hundreds of dollars in extra roofing and mason work. The cover of centerseal is set with a straddle, by which any combination of boxes may be worked, either in fours or in couples. This facilitated their erection, as gas had to be supplied all the time; and, further, it will be convenient for repairs in the future. A 12 inch bye-pass with gates, drains for seals, suitable steam coils suspended from overhead, and necessary drip and sewer connections make the whole arrangement of boxes and meter extremely convenient and accessible. Mr. J. P. Whittier was the contractor for the building, and the work was planned and supervised by Mr. F. B. Wheeler, Superintendent, who was formerly with the Derby Gas Company, and more recently with the Holyoke (Mass.) Gas Company. The building is open for inspection, and, in fact, it has already been visited by many gas men on a tour of inspection.

DURING the cyclone that visited Washington, D. C., at mid-day of the 23d inst., the Washington Gas Light Company was a prominent sufferer. The storm was accompanied by lightning and thunder, and a flash of the former found its way to earth by means of the Company's holder, corner of 26th and G streets. The Associated Press reports say that the holder was badly wrecked, but that the contained gas (estimated at 500,000 cubic feet) was ignited and burned off through the rents through which it streamed, without any explosive development. The loss to the Company is put at $50,000; but we hope and believe that this figure is well in excess of the actual damage sustained.

THE mismanagement that caused the break in the main conduit upon which Brooklyn depends for its water supply not only brought about a water famine in the City of Churches, but also shut off the gas supply from the outlying town of Woodhaven. The point where the cave-in occurred was also the location of the main leading from the works of the Union Gas Light Company to Woodhaven, hence the disruption.

MESSRS. WILLIAM CRAMP & SONS' Ship and Engine Company, of Philadelphia, are making extensive changes in their plant, and have placed the contract for a new boiler shop with the Berlin Iron Bridge Company, of East Berlin, Conn. This boiler shop will be constructed entirely of iron, and will be composed of two parts, one part 55 feet in width by 350 feet in length, made very high between joints, on account of moving large marine boilers over each other. This portion of the building is controlled by a 50-ton travelling crane, which is to be furnished by William Sellers & Co., of Philadelphia. Connected with this main portion will be a wing 58 feet wide by 370 feet long served the whole length by a 20 ton Sellers travelling crane. The building is composed entirely of iron, from the designs of The Berlin Company, and will be one of the most complete of its kind as no pains or expense have been spared to make it perfect in every detail.

THE vagaries of the street urchins in Lynnfield road, have resulted in such damage to the Lynn (Mass.) Gas and Electric Light Company—for 20 consecutive nights the Company asserts valuable globes over the public lights have been wantonly smashed—that the latter proposes to hold the Committee on Fuel and Street Lights responsible for the loss.

A Non-Corrosive Metal Gas Tip.

Much effort has been made by inventors in recent years to obtain a gas tip that would afford satisfactory results to the gas consumer, and the last specimen put upon the market is shown in the accompanying illustration.

It is said to be absolutely non-corrosive, a result brought about, according to the inventors, of their treatment of the metal by a "special" process. It possesses decided advantages over the lava tip, which has been in common use for several years, in that it does not chip off and cannot be broken. For this reason, it is especially adapted for use in mills and factories, where such accidents are liable to occur.

The inventors say that it furnishes a clear and steady flame from any gas, whether the latter be rich rosin gas, water gas, or heavy gasoline gas, being made in forms suitable for gases of any grade.

Strange Flames.

The London *Journal* "notes" that in connection with the research that is being made into the problem of the production of light by other means than by combustion, it is of interest to remark some of the experiments of M. Moissan upon the gaseous element fluorine, which he has recently succeeded in isolating. Fluorine seems to answer to that ideal conception of the old alchemists—the universal solvent. It possesses most intense chemical activity. The gas is obtained by electrolysis, conducted under a variety of ingeniously devised conditions necessitated by the corrosive nature of the product. Many different sorts of flames are produced by allowing fluorine gas to come into contact with other elements. With hydrogen, combination takes place explosively even at a temperature of —23°, and in the dark. If a tube delivers fluorine into an atmosphere of hydrogen, a very hot blue flame, bordered with red, a once appears at the end of the tube. Bromine vapour combines with fluorine in the cold, with production of a very bright, but low-temperature, flame. Iodine gives a pale flame; phosphorus and arsenic combine with fluorine with lively incadescence. Carbon in a finely-divided state combines with fluorine even at ordinary temperature. Purified lamp-black inflames instantly with great brilliancy; as do also the lighter varieties of wood charcoal. The amorphous variety of boron likewise ignites instantly in fluorine, with projection of brilliant sparks; but the most beautiful of all these extraordinary displays of chemical activity is the reaction between fluorine and silicon. The cold crystals immediately become white hot, and then burn with a very hot flame, scattering showers of stars in all directions. Many other substances burn in fluorine, according to details published by M. Moissan in the *Annales de Chimie et de Physique*. The reason for some of the flames produced being of low temperature, though of high illuminating power, is a matter demanding further investigation.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

November 30.

☞ All communications will receive particular attention. ☜ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	99¼	100
Central	500,000	50	--	90
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	122	126
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	120	122
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	40	45
Preferred	5,000,000	100	—	82
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	109	115
Citizens	1,200,000	20	80	82
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	118	122
" Bonds	300,000		102	—
Peoples	1,000,000	10	68	72
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	97	100
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	127	135
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	110	117
" Bonds	1,000,000	—	107	109
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	84	86
2d " " "	3,000,000	1000	70	74
Bay State Gas Co.—				
Stock	5,000,000	50	50½	51
Income Bonds	2,000,000	1000	98	102
Buffalo Mutual, N. Y.	750,000	100	105	110
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds.	45,000	—	—	—
Chicago Gas Company.	25,000,000	100	61¾	62
Chicago Gas Light. & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	85⅛

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Of scientific education, successful record, and favorable experience in control of help, age 25, wants employment. Chemical and photometric control of gas. Analysis of bye-products, gas coal, etc. BALDWIN,

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By a young man fully experienced in the details of manufacture and distribution: or as Superintendent of combined Gas and Electric Plant. Best of references. Address

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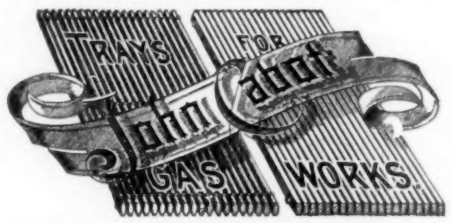

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" 50 " 60 " "
" 100 " 55 " "

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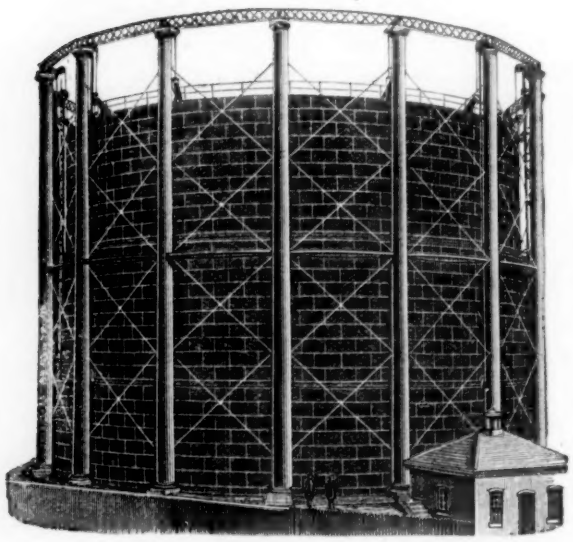

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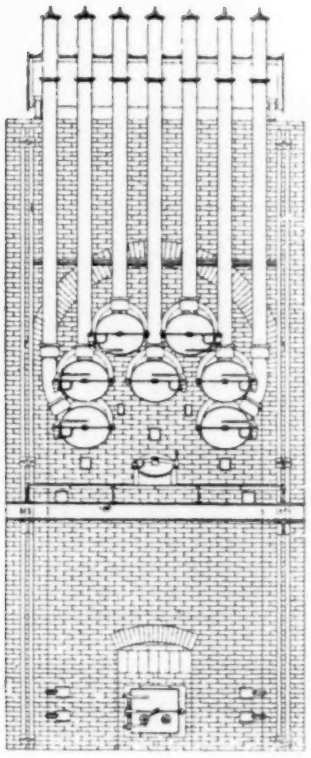

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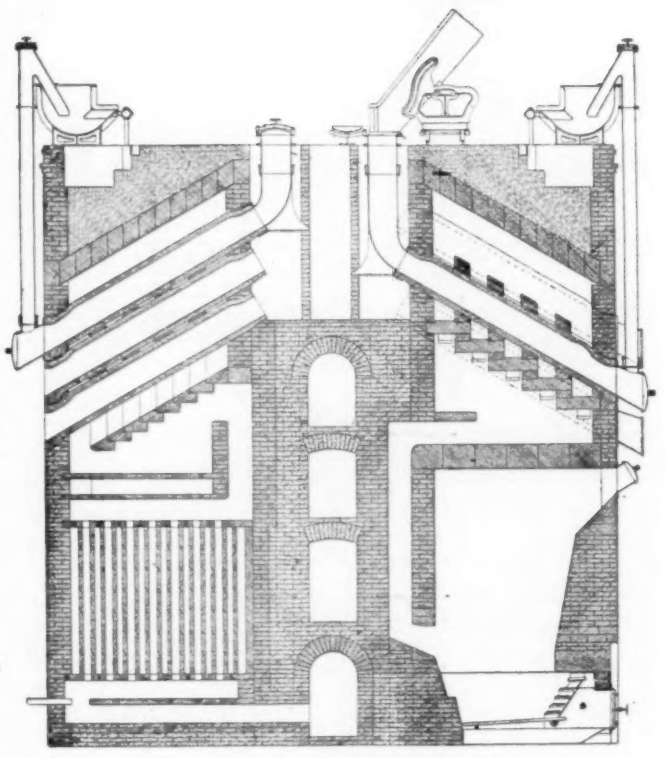

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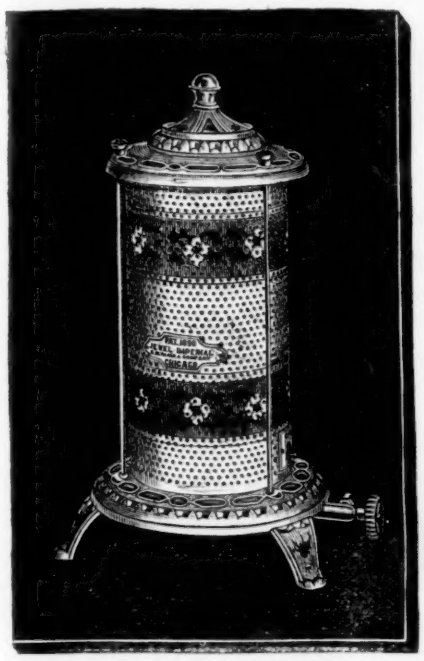

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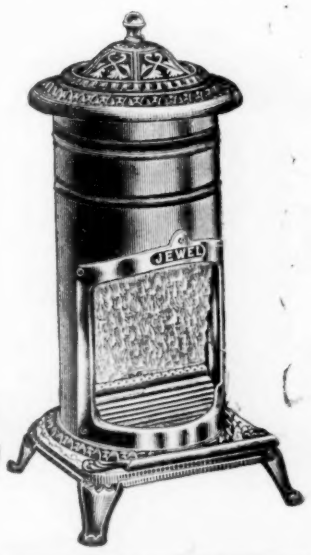

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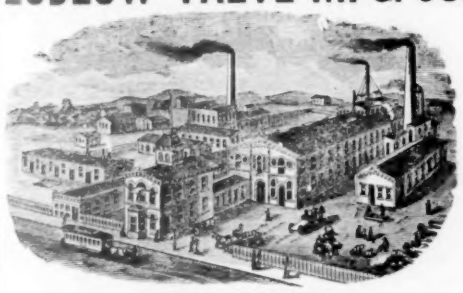

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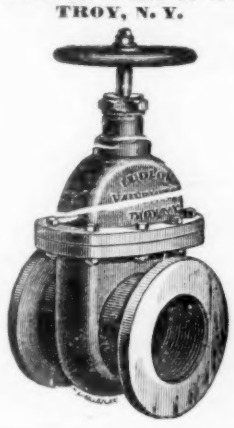

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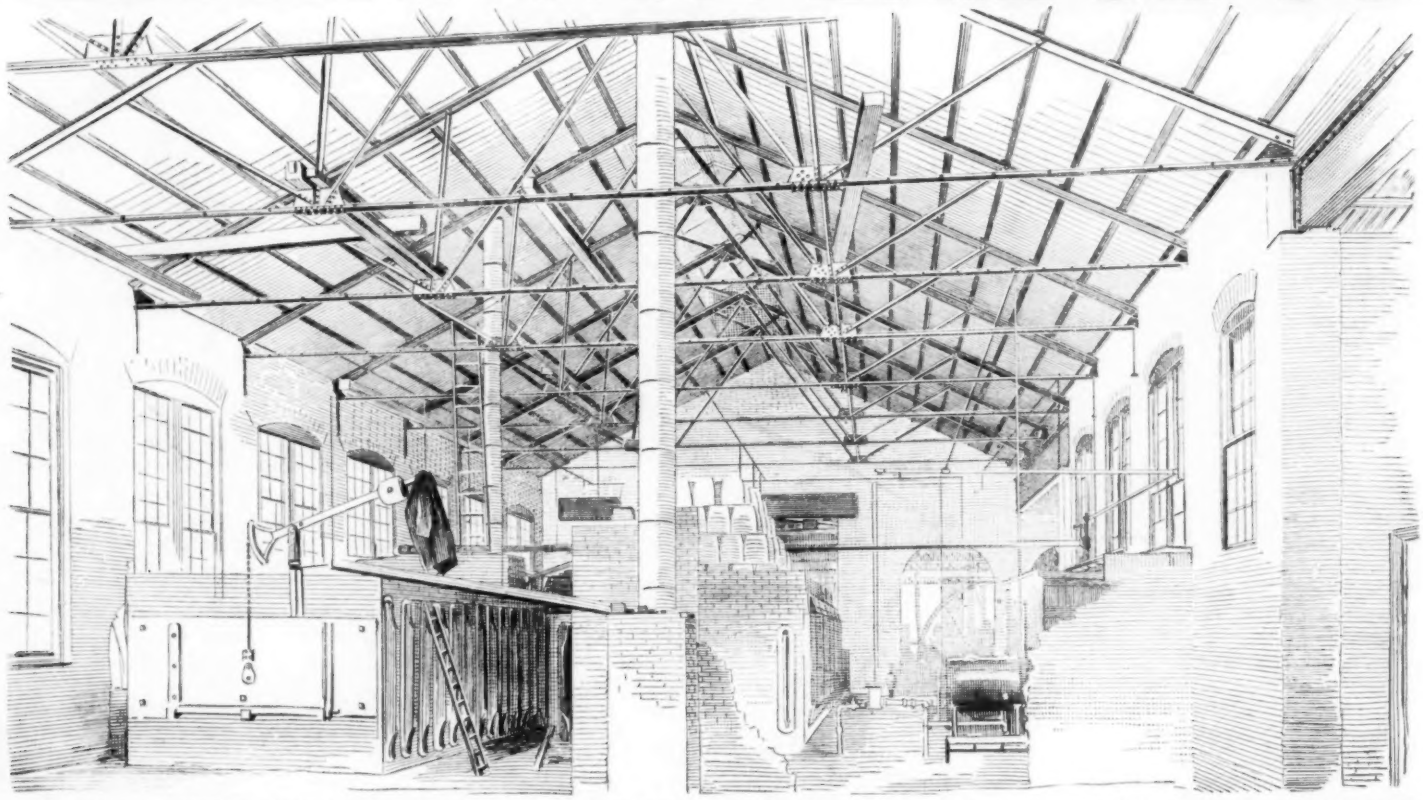

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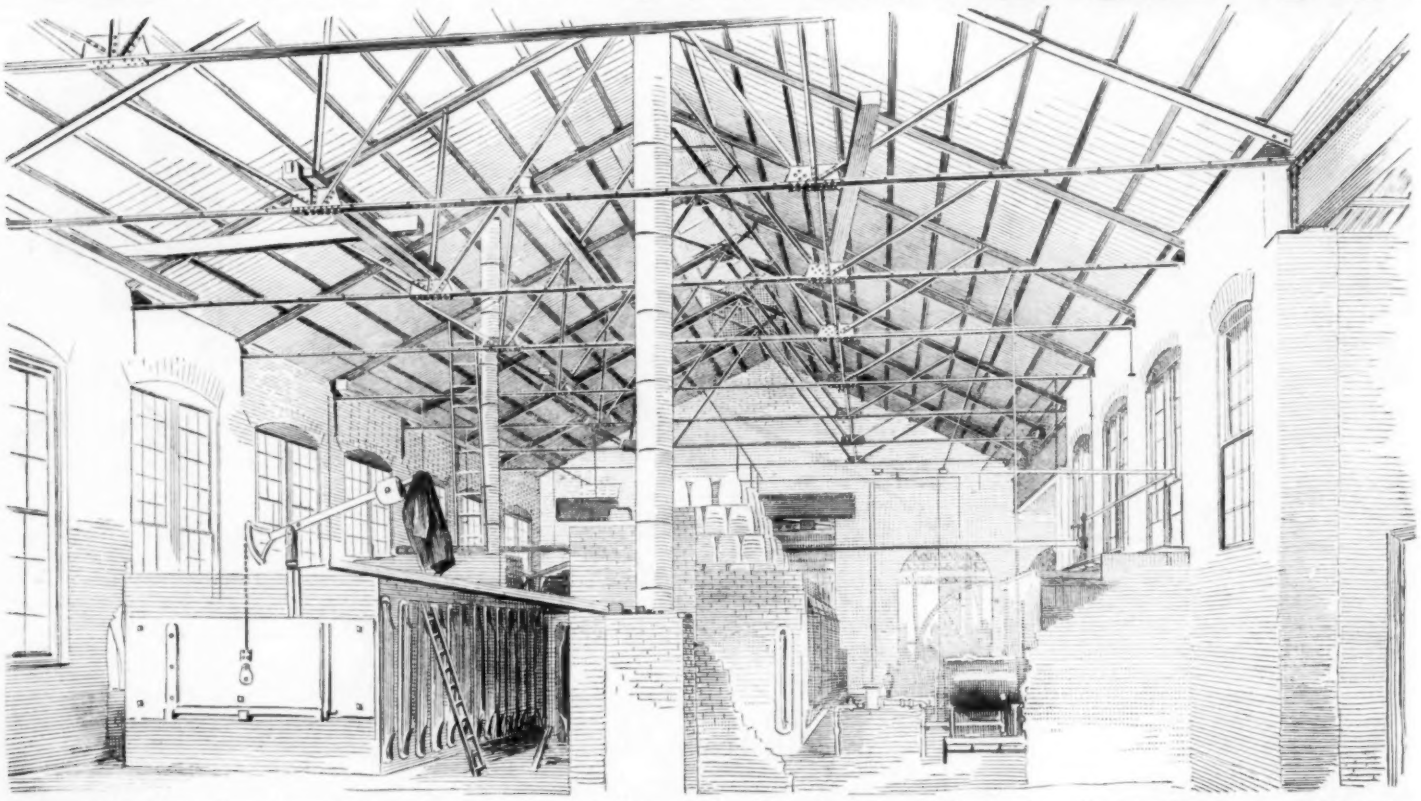

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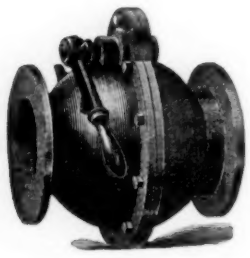

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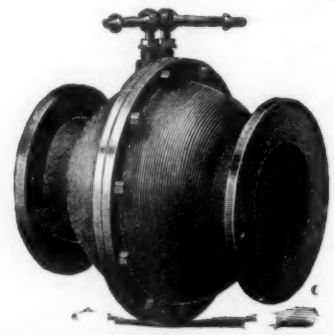

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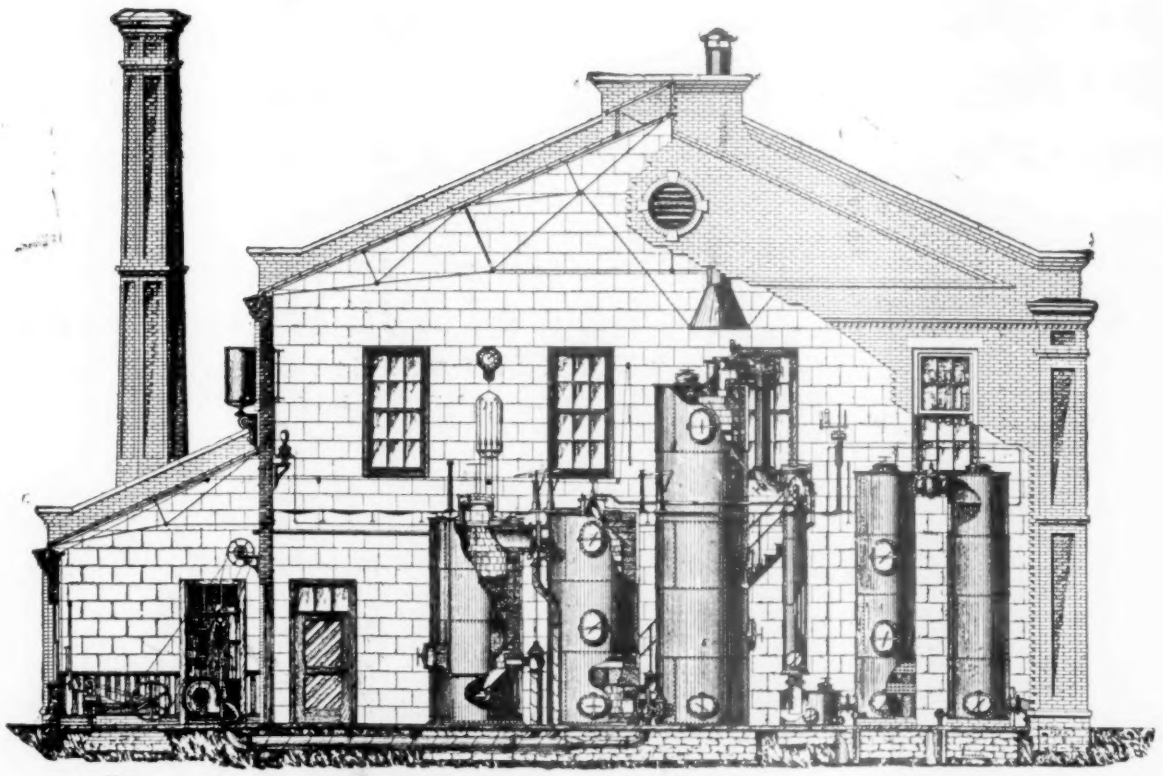

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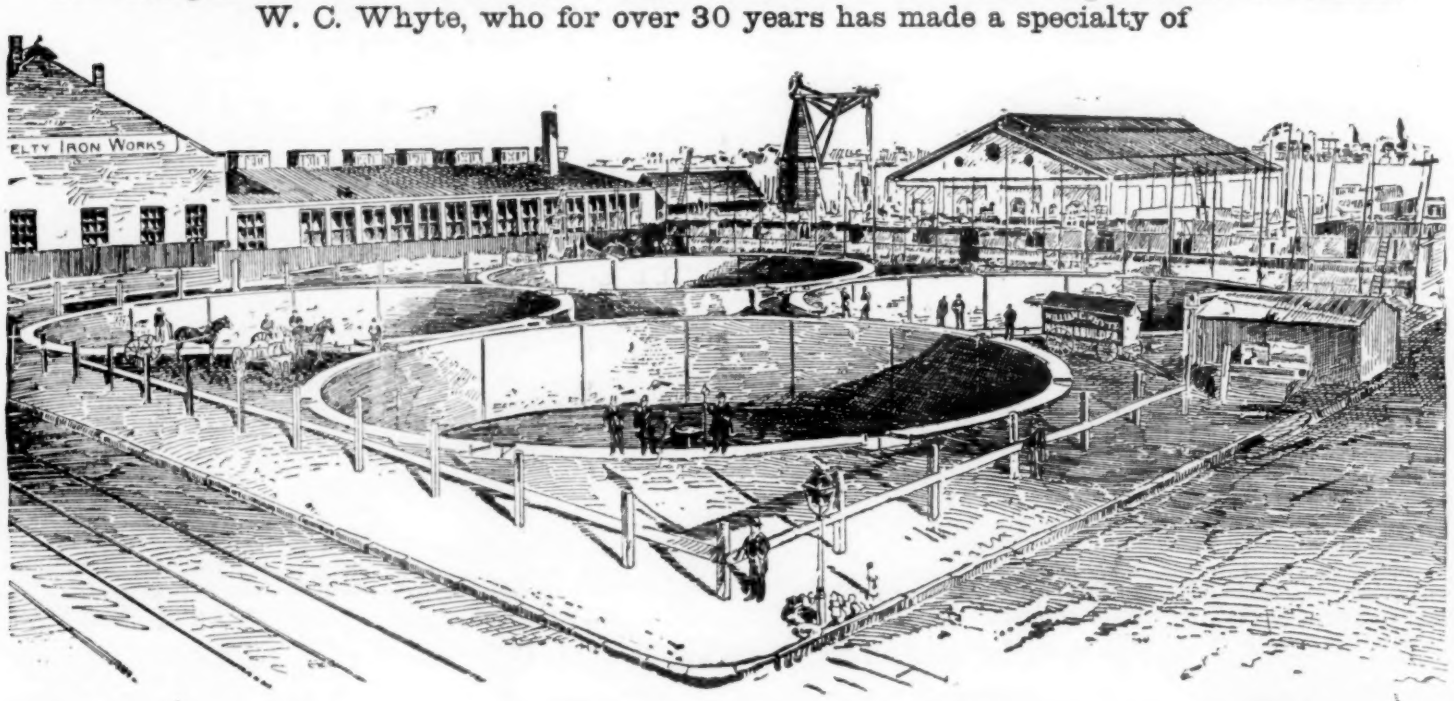

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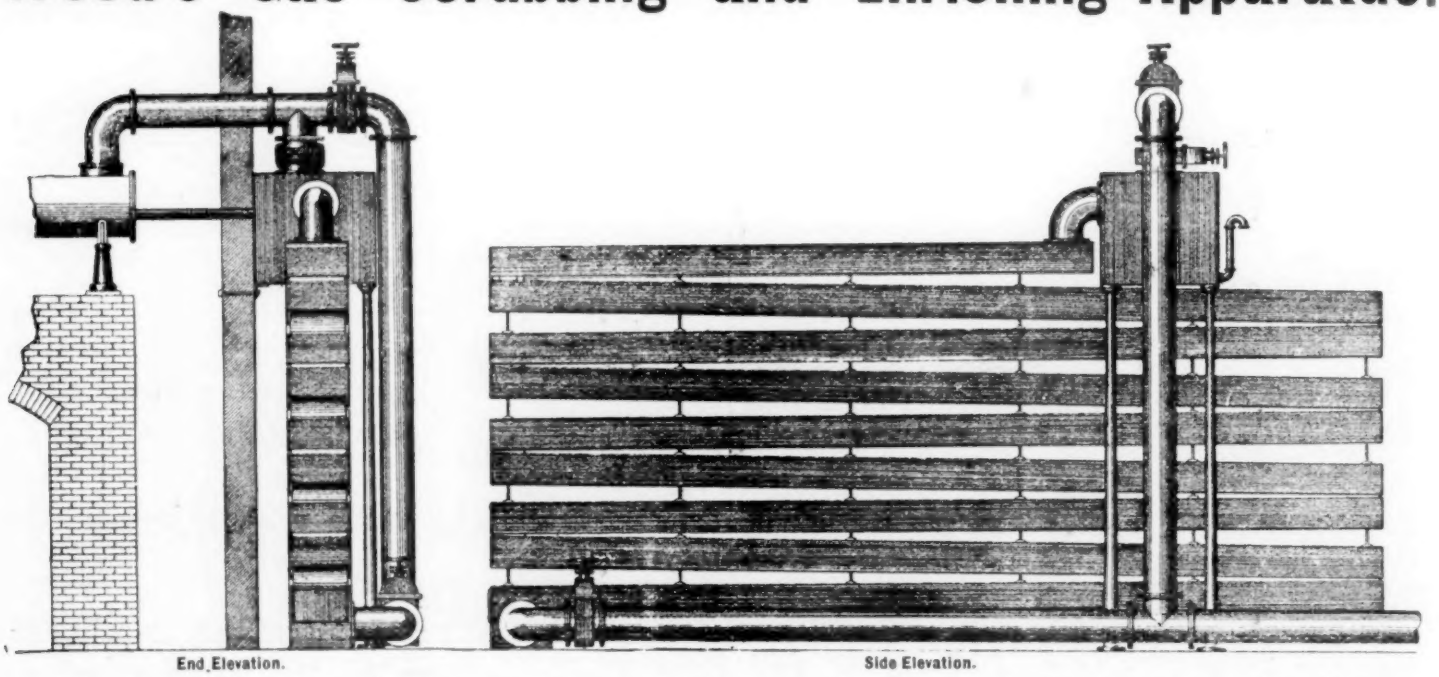

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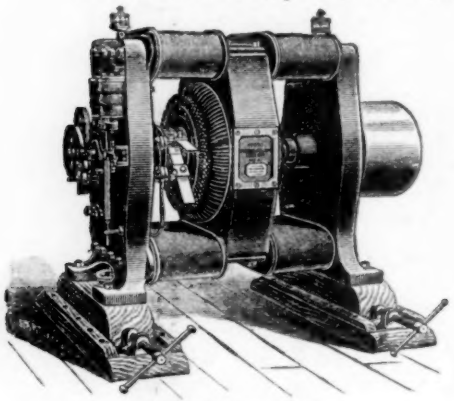

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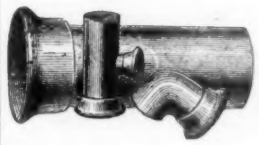

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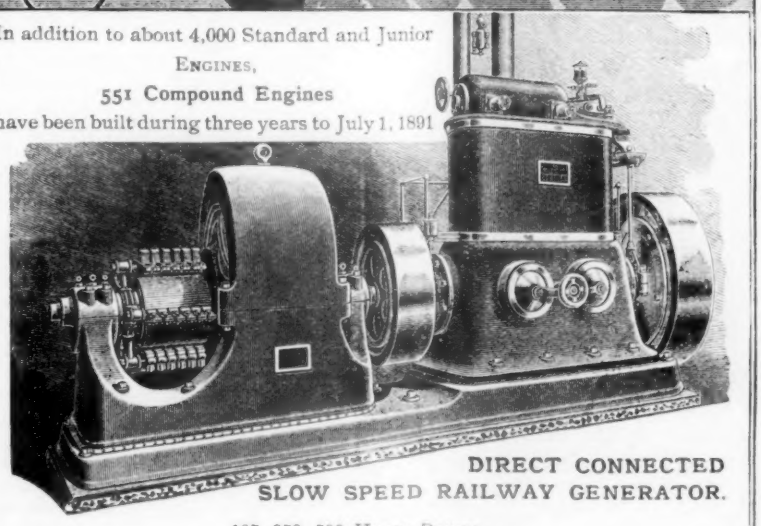

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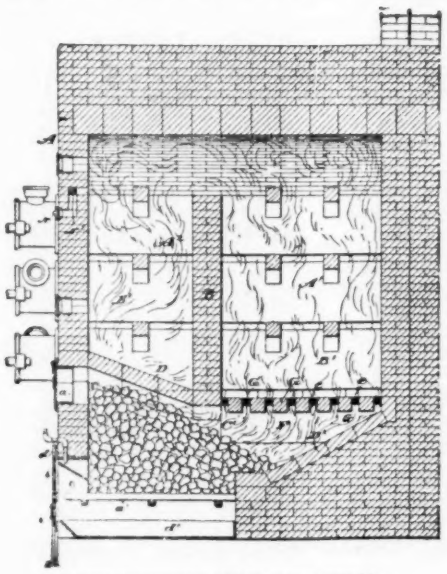

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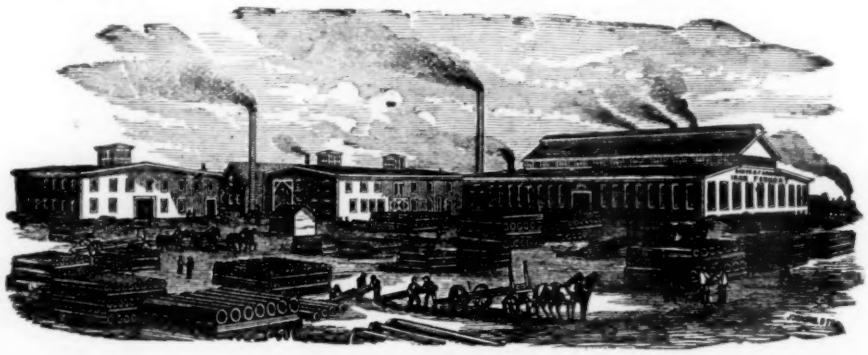

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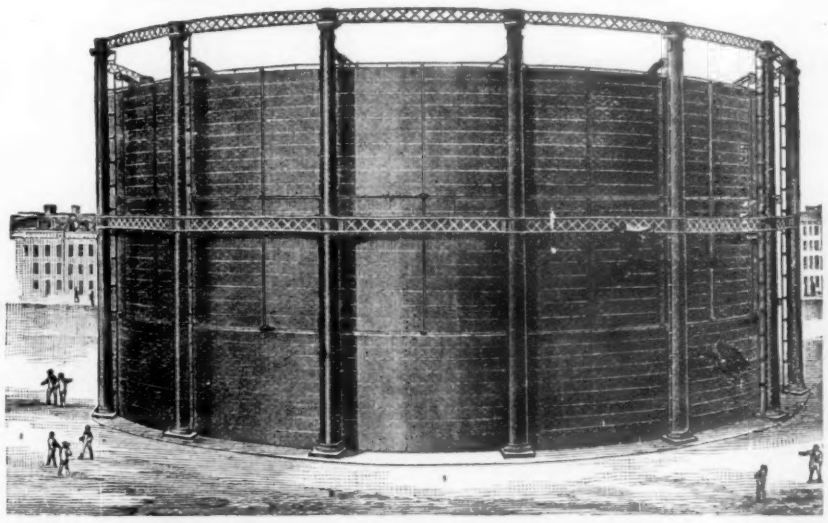

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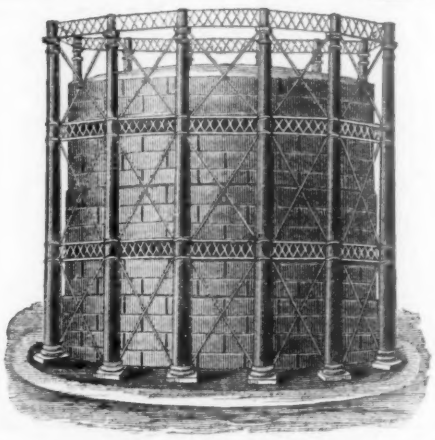

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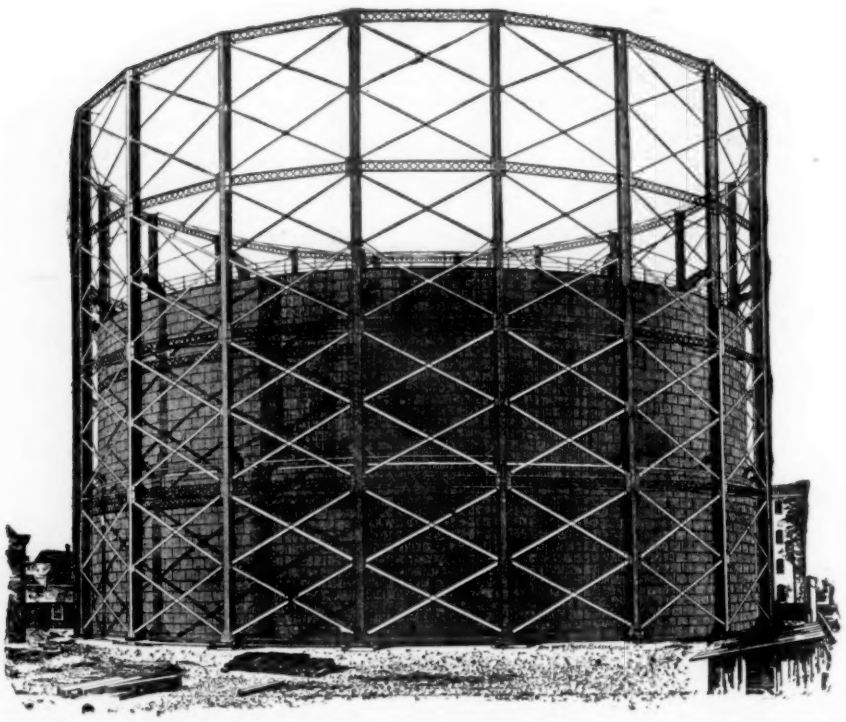

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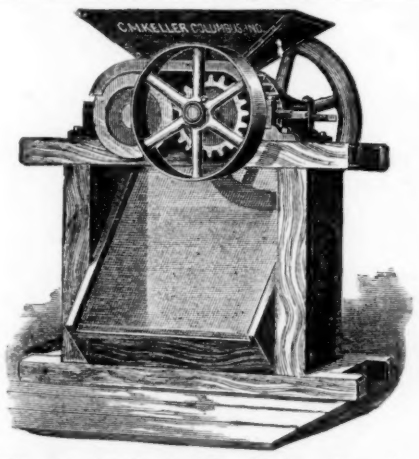

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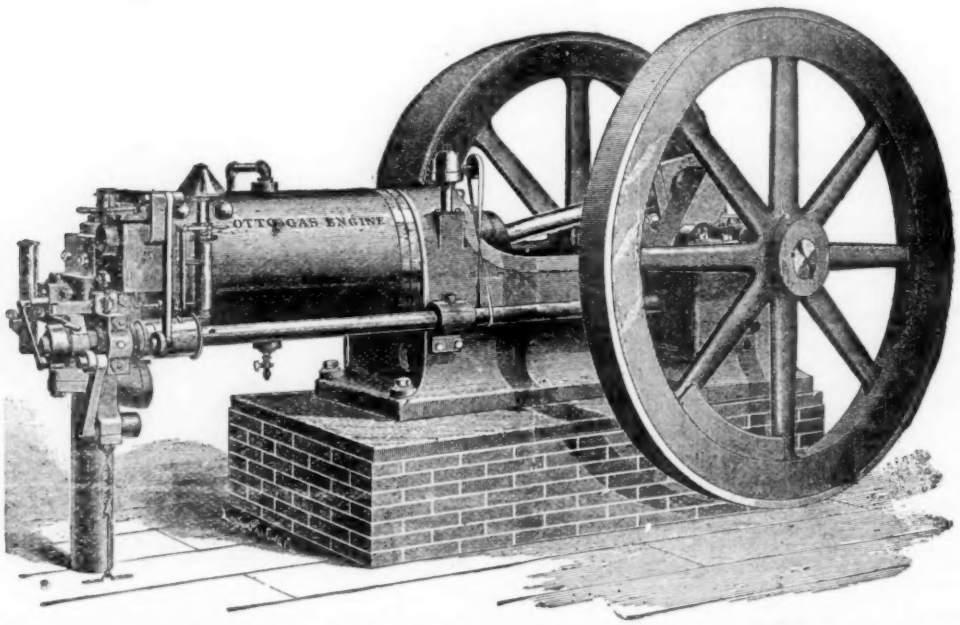

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